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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/606,873	06/26/2003	Robert S. Bosko	L-0170.96	5255

7590 02/12/2008

ROBERT S. BOSKO
BOSKO WATER TECHOLOGIES
2570 FOREST DRIVE
BLIND BAY, BC VOE 1H1
CANADA

EXAMINER	
SAVAGE, MATTHEW O	
ART UNIT	**PAPER NUMBER**
1797	

MAIL DATE	DELIVERY MODE
02/12/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

10/606873 Examiner: SAVAGE, MATTHEW GAU: 1724
Inventor: BOSKO , ROBERT Classification: 210/791.000
Status: 124 - ON APPEAL -- AWAITING DECISION BY THE BOARD OF APPEALS
Title: METHOD AND APPARATUS FOR A WATER FILTER BACKFLUSH

PROSECUTION tab report (58 items, sorted by Date DESC)

Img	Status	Doc Code	Document Type	Date	Pages	Annotations
	13	N578	Notification of Withdrawal of Attorney	10/19/2007	2	
	10	PA..	Power of Attorney	08/24/2007	2	P.WD.ATTY. STS.123
	13	CTMS	Miscellaneous Action with SSP	06/28/2007	2	Suppl. Appeal Summary filed 6/11/2007
	7	SAPB	Supplemental Appeal Brief	06/11/2007	2	Summary of Claimed Subject Matter
	7	SAPB	Supplemental Appeal Brief	06/11/2007	3	
	7	CTMS	Miscellaneous Action with SSP	05/14/2007	2	
	7	APRD	Order Returning Undocketed Appeal to the examiner from BPAI	05/09/2007	2	
	7	APEA	Examiner's Answer to Appeal Brief	11/22/2006	9	
	7	AP.B	Appeal Brief Filed	09/06/2006	21	
	7	N/AP	Notice of Appeal Filed	07/06/2006	2	Appeal no. 2008-1719.
	7	CTAV	Advisory Action (PTOL-303)	06/16/2006	3	
	7	ANE.I	Amendment After Final or under 37CFR 1.312, initialed by the examiner.	06/16/2006	1	
	7	A.NE	Amendment After Final	06/05/2006	1	
	7	CLM	Claims	06/05/2006	3	
	7	REM	Applicant Arguments/Remarks Made in an Amendment	06/05/2006	11	
	7	WFEE	Fee Worksheet (PTO-06)	06/05/2006	1	
	7	CTFR	Final Rejection	04/06/2006	7	
	7	BIB	Bibliographic Data Sheet	04/06/2006	2	
	7	SRFW	Search information including classification, databases and other search related notes	04/06/2006	1	

PROSECUTION tab report (58 items, sorted by Date DESC)

Img	Status	Doc Code	Document Type	Date	Pages	Annotations
	7	A...	Amendment - After Non-Final Rejection	01/25/2006	1	
	7	SPEC	Specification	01/25/2006	1	
	7	CLM	Claims	01/25/2006	3	
	7	REM	Applicant Arguments/Remarks Made in an Amendment	01/25/2006	3	
	7	WFEE	Fee Worksheet (PTO-06)	01/25/2006	1	
	7	CTNF	Non-Final Rejection	11/28/2005	7	
	7	AMSB	Amendment Submitted/Entered with Filing of CPA/RCE	11/15/2005	1	
	7	SPEC	Specification	11/15/2005	1	
	7	REM	Applicant Arguments/Remarks Made in an Amendment	11/15/2005	8	
	7	RCEX	Request for Continued Examination (RCE)	11/15/2005	2	
	7	WFEE	Fee Worksheet (PTO-06)	11/15/2005	1	
	7	CTAV	Advisory Action (PTOL-303)	10/12/2005	3	
	7	ANE.I	Amendment After Final or under 37CFR 1.312, initialed by the examiner.	10/12/2005	1	
	7	A.NE	Amendment After Final	09/22/2005	1	
	7	SPEC	Specification	09/22/2005	1	
	7	REM	Applicant Arguments/Remarks Made in an Amendment	09/22/2005	7	
	7	WFEE	Fee Worksheet (PTO-06)	09/22/2005	1	
	7	IDS	Information Disclosure Statement (IDS) Filed	09/16/2005	3	
	7	CTFR	Final Rejection	08/18/2005	6	
	7	A...	Amendment - After Non-Final Rejection	04/25/2005	2	

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Img	Status	Doc Code	Document Type	Date	Pages	Annotations
	7	REM	Applicant Arguments/Remarks Made in an Amendment	04/25/2005	5	
	7	WFEE	Fee Worksheet (PTO-06)	04/25/2005	1	
	7	EBCC.AD	Notice of Change of Address placed in File Wrapper due to EBC Customer Number update	02/23/2005	1	
	7	CTNF	Non-Final Rejection	02/22/2005	5	
	7	SRFW	Search information including classification, databases and other search related notes	02/22/2005	1	
	7	ELC.	Response to Election / Restriction Filed	01/10/2005	2	
	7	CLM	Claims	01/10/2005	2	
	7	REM	Applicant Arguments/Remarks Made in an Amendment	01/10/2005	1	
	7	WFEE	Fee Worksheet (PTO-06)	01/10/2005	1	
	7	CTRS	Requirement for Restriction/Election	12/21/2004	6	
	7	TRNA	Transmittal of New Application	06/26/2003	2	
	7	SPEC	Specification	06/26/2003	11	
	7	CLM	Claims	06/26/2003	6	
	7	ABST	Abstract	06/26/2003	1	
	7	DRW	Drawings-only black and white line drawings	06/26/2003	7	
	7	OATH	Oath or Declaration filed	06/26/2003	3	
	7	IDS	Information Disclosure Statement (IDS) Filed	06/26/2003	3	
	7	WFEE	Fee Worksheet (PTO-06)	06/26/2003	1	
	7	WFEE	Fee Worksheet (PTO-06)	06/26/2003	1	

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BIB DATA SHEET

CONFIRMATION NO. 5255

SERIAL NUMBER	FILING or 371(c) DATE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
10/606,873	06/26/2003 RULE	210	1724	L-0170.96

APPLICANTS

Robert S. Bosko, San Antonio, TX;

** **CONTINUING DATA** *************************

** **FOREIGN APPLICATIONS** *************************

** **IF REQUIRED, FOREIGN FILING LICENSE GRANTED** **

10/09/2003

Foreign Priority claimed ❑ Yes ❑ No 35 USC 119(a-d) conditions met ❑ Yes ❑ No Verified and Acknowledged ______ Examiner's Signature	❑ Met after Allowance ______ Initials	STATE OR COUNTRY	SHEETS DRAWINGS	TOTAL CLAIMS	INDEPENDENT CLAIMS
		TX	7	42	7

ADDRESS

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BLIND BAY, BC VOE 1H1
CANADA

TITLE

Method and apparatus for a water filter backflush

FILING FEE RECEIVED		
1482	FEES: Authority has been given in Paper No.____________ to charge/credit DEPOSIT ACCOUNT No.____________ for following:	❑ All Fees ❑ 1.16 Fees (Filing) ❑ 1.17 Fees (Processing Ext. of time) ❑ 1.18 Fees (Issue) ❑ Other ________________ ❑ Credit

Application Number Information

Application Number: 10/606873 Assignments	Examiner Number: 67075 / SAVAGE, MATTHEW	
Filing or 371(c) Date: 06/26/2003 eDan	Group Art Unit: 1724	IFW Madras
Effective Date: 06/26/2003	Class/Subclass: 210/791.000	Waiting for Response Desc.
Application Received: 06/27/2003	Lost Case: NO	
Pat. Num./Pub. Num: /20040262243	Appeal Number: 20081719	MPEAC
Issue Date: 00/00/0000	Unmatched Petition: NO	Prior Art Filed
Date of Abandonment: 00/00/0000	L&R Code: Secrecy Code:1	
Attorney Docket Number: L-0170.96	Third Level Review: NO	Secrecy Order: NO
Status: 124 /ON APPEAL -- AWAITING DECISION BY THE BOARD OF APPEALS		Status Date: 02/11/2008
Confirmation Number: 5255	Oral Hearing: NO	

Title of Invention: METHOD AND APPARATUS FOR A WATER FILTER BACKFLUSH

Bar Code	PALM Location	Location Date	Charge to Loc	Charge to Name	Employee Name	Location

Appln Info Contents Petition Info Atty/Agent Info Continuity/Reexam Foreign Data

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ROBERT S. BOSKO
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2570 FOREST DRIVE
BLIND BAY, BC VOE 1H1

Appeal No: 2008-1719
Application: 10/606,873
Appellant: Robert S. Bosko

Board of Patent Appeals and Interferences
Docketing Notice

Application 10/606,873 was received from the Technology Center at the Board on October 05, 2007 and has been assigned Appeal No: 2008-1719.

A review of the file indicates that the following documents have been filed by appellant:

Appeal Brief filed on:	September 06, 2006
Reply Brief filed on:	NONE
Request for Hearing filed on:	NONE

In all future communications regarding this appeal, please include both the application number and the appeal number.

The mailing address for the Board is:

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The facsimile number of the Board is 571-273-0052. Because of the heightened security in the Washington D.C. area, facsimile communications are recommended. Telephone inquiries can be made by calling 571-272-9797 and should be directed to a Program and Resource Administrator.

By order of the Board of Patent Appeals and Interferences

SUMMARY OF CLAIMED SUBJECT MATTER

Claim 1

Claim 1 outlines the method steps for cleansing a filter 101 with purified water. Applicant's specification defines "purified water" as "water having a lower total dissolved solids reading than the water being filtered, preferably with a total dissolved solids reading fifty percent lower than that of the water being filtered, more preferably with a total dissolved solids reading eighty percent lower than the water being filtered, and still, more preferably, with a total dissolved solids reading ninety five percent lower than that of the water being filtered," (see page 5, lines: 5-10). Applicant has further defined "filtration devices" as devices that remove particles up to a preselected size range (see page 2, lines: 15-16). Applicant's invention describes delivering "filtered water" to an end use device 107, and cleansing the filter 101 in the filtered flowpath with purified water.

The first step of claim 1 recites, "passing water from a water source 106 through a filter 101, thereby producing filtered water," (see page 6, lines: 8-15, in light of Figure 3). Filtration devices in this disclosure include filters 101 that remove particles up to a pre-selected size range (see page 2, lines: 15-16).

The second step of claim 1 recites, "delivering the filtered water to an end use device 107," (see page 6, lines: 15-16, in light of Figure 3).

The third step of claim 1 recites, "providing a source of purified water, wherein the purified water has a lower total dissolved solids reading than the water being filtered," (see page 3, lines: 5-7).

The fourth step of claim 1 recites, "exposing the filter 101 to the purified water." Applicant's invention discloses a variety of forms to cleanse the filter 101, including submerging

a filter 101 or a filter cartridge 118 into a container holding purified water and backflushing the filter 101 or filter cartridge 118 (see page 5, lines: 19-23, in light of Figures 1-3).

Claim 36

Claim 36 is drawn to a backflush unit 100 utilizing a primary flowpath 150 for delivering filtered water to an end use device 107, and a secondary flowpath 160 used for backflushing routines, wherein purified water is the source water for backflushing the filter 101 (see page 6, lines: 6-16, in light of Figure 4). Switching an inlet valve 102, a drain valve 104, and a flush valve 103 substantially simultaneously provides two distinct flowpaths (see page 7, lines: 13-22 through page 8, lines: 1-3). The secondary flowpath 160 is in fluid communication with the flush source 108 (see page 7, lines: 3-7, in light of Figure 4), whereby purified water moves backwards through the filter 101 and then moves past the drain valve 104. Accordingly, switching the valves 102, 103, and 104 a second time returns the backflush unit 100 to the primary flowpath 150, with the concentrations of solids removed from the primary flowpath 150 (see page 8, lines: 12-23 through page 9, lines: 1-3).

The first step of claim 36 recites, "flowing water from a water source through a primary flowpath 150 in a filtered flowpath to an end use device 107, thereby delivering filtered water to the end use device 107," (see page 6, lines: 6-16 in light of Figure 4).

The second step of claim 36 recites, "providing a source of purified water 108, wherein the purified water has a lower total dissolved solids reading than the water being filtered," (see page 8, lines: 4-9, in light of Figure 4). Applicant further asserts that Applicant has defined "purified water" in the specification (see page 5, lines: 4-9).

The third step of claim 36 recites, "switching an inlet valve 102, a drain valve 104, and a flush valve 103 in the filtered flowpath from the primary flowpath 150 to a secondary flowpath 160 that allows purified water into the filtered flowpath," (see page 7, lines: 12-14, and page 8, lines: 1-3, in light of Figure 4).

The fourth step of claim 36 recites, "flowing the purified water into the secondary flowpath 160, wherein the secondary flowpath 160 allows the purified water to flow backwards through the filter 101 for a predetermined interval to remove or dissolve filtered media or unclog a filter 101 in the primary flowpath 150," (see page 8, lines: 15-21, in light of Figure 3).

The fifth step of claim 36 recites, "switching the inlet valve 102, the drain valve 104, and the flush valve 103 from the secondary flowpath 160 to the primary flowpath 150 to resume the delivery of filtered water to the end use device 107," (see page 8, lines: 21-23 through page 9, lines: 1-2, in light of Figure 4).

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/606,873	06/26/2003	Robert S. Bosko	L-0170.96	5255

41418 7590 05/14/2007

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EXAMINER	
SAVAGE, MATTHEW O	

ART UNIT	PAPER NUMBER
1724	

MAIL DATE	DELIVERY MODE
05/14/2007	PAPER

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The time period for reply, if any, is set in the attached communication.

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APPLICATION NO./ CONTROL NO.	FILING DATE	FIRST NAMED INVENTOR / PATENT IN REEXAMINATION	ATTORNEY DOCKET NO.
10606873	6/26/03	BOSKO, ROBERT S.	L-0170.96

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EXAMINER	
Matthew O. Savage	
ART UNIT	**PAPER**
1724	20070511

DATE MAILED:

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Commissioner for Patents

NOTIFICATION OF NON-COMPLIANCE WITH THE REQUIREMENTS OF 37 CFR 41.37(c)

The brief does not contain a concise explanation of the subject matter defined in each of the independent claims involved in the appeal, referring to the specification by page and line number, and to the drawing, if any, by reference characters; and/or does not identify the structure, material, or acts described in the specification as corresponding to each claimed function for every means plus function and step plus function for each independent claim involved in the appeal and for each dependent claim argued separately by reference to the specification by page and line number, and to the drawing, if any, by reference characters, as required by 37 CFR 41.37(c)(1)(v). Appellant is required to comply with provisions of 37 CFR 41.37(c).

To avoid dismissal of the appeal, Appellant must comply with the provisions of 37 CFR 41.37(c) within ONE MONTH or THIRTY DAYS, whichever is longer, from the mailing of this communication. Extensions of time may be granted under 37 CFR 1.136.

Matthew O. Savage
Matthew O Savage
Primary Examiner
Art Unit: 1724

PTO-90C (Rev.04-03)

UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte ROBERT S. BOSKO

Application 10/606,873
Technology Center 1700

ORDER RETURNING UNDOCKETED APPEAL TO EXAMINER

This application was electronically received at the Board of Patent Appeals and Interferences on February 5, 2007. A review has revealed that the application is not ready for docketing as an appeal. Accordingly, this application is herewith being returned to the Examiner. The matter requiring attention prior to docketing is identified below:

Appellant filed an Appeal Brief which was received by the USPTO on September 6, 2006. The content provided under the heading "SUMMARY OF CLAIMED SUBJECT MATTER" is deficient in that it does not provide a concise explanation of the subject matter defined in each of the independent claims involved in the appeal and each dependent claim argued separately.
Correction is required. MPEP § 1205.03 states:

> When the Office holds the brief to be defective solely due to appellant's failure to provide a summary of the claimed subject matter as required by 37 CFR 41.37(c)(1)(v), an entire new brief need not, and should not, be filed. Rather, a paper providing a summary of the claimed subject matter as required by 37 CFR 41.37(c)(1)(v) will suffice. Failure to timely respond to

the Office's requirement will result in dismissal of the appeal. See MPEP § 1215.04 and §711.02(b).

Accordingly, it is ORDERED that the application is returned to the Examiner to:

1) hold the Appeal Brief filed on September 6, 2006, defective;

2) notify appellants to file a paper providing a summary of the claimed subject matter as required by 37 CFR 41.37(c)(1)(v);

3) consider the paper providing a summary of the claimed subject matter as required by 37 CFR 41.37(c)(1)(v) and;

4) for such further action as may be appropriate.

BOARD OF PATENT APPEALS
AND INTERFERENCES

By: ______________________
PATRICK J. NOLAN
Deputy Chief Appeals Administrator
(571) 272-9797

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PJN/hh

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41418 7590 11/22/2006

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EXAMINER	
SAVAGE, MATTHEW O	
ART UNIT	**PAPER NUMBER**
1724	

DATE MAILED: 11/22/2006

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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 10/606,873
Filing Date: June 26, 2003
Appellant(s): BOSKO, ROBERT S.

Christopher L. Makay
For Appellant

EXAMINER'S ANSWER

MAILED
NOV 22 2006
GROUP 1700

This is in response to the appeal brief filed 9-6-06 appealing from the Office action mailed 4-6-06.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is incorrect. A correct statement of the status of the claims is as follows:

This appeal involves claims 1, 2, 5, 8, 36, 37, and 40.

Claims 2, 6, 7, 38, 41, and 42 have withdrawn from consideration as not directed to the elected species.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is substantially correct. The changes are as follows: the statement should read "Whether claims 1, 2, 5, 8, 36, 37, and 40 are patentable over Hisada in view of McGowan".

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

6,190,557	HISADA ET AL	2-2001
6,562,246	MCGOWAN	5-2003

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1, 2, 5, 8, 36, 37, and 40 are rejected under 35 U.S.C. 103(a) as being unpatentable over in Hisada et al view of McGowan.

With respect to claim 1, Hisada et al discloses a method of cleansing a filter 1 including passing water from a water source through a filter producing filtered water (see lines 6-18 of col. 14), providing a source of purified water (e.g., filtered water from the permeate side of the reverse osmosis membrane, see FIG. 6 and lines 35-49 of col. 14), the purified water having a lower total dissolved solids reading than the water being filtered since a reverse osmosis filter can remove up to 99% dissolved minerals from water, and exposing the filter to the purified water (e.g., via backwashing as shown in

FIG. 6 with the permeate). Hisada et al fail to specify delivering the filtered water to an end use device. McGowan discloses the concept of delivering a filtered fluid to an end use device in the form of "outside systems" via conduit 26 and valve 36 (see lines 15-18 of col. 4) and teaches that such a step enables use of the filtered water. It would have been obvious to have modified the method of Hisada et al so as to have included the step of delivering the filtered water to an end use device as suggested by Hisada et al in order to make use of the filtered water.

Concerning claim 2, Hisada et al discloses a filter cartridge 1.

As to claim 5, Hisada et al discloses purified water having a total dissolved solids reading of at least 50% less than the water being filtered since a reverse osmosis filter can remove up to 99% dissolved minerals from water.

Concerning claim 8, Hisada et al discloses backwashing the filter with purified water (e.g., permeate, see FIG. 6 and lines 35-49 of col. 14).

With respect to claim 36, Hisada et al disclose a method for back flushing a filter 1 including flowing water from a water source 51 (see FIG. 4) through a primary flowpath in a filtered flow path 52, providing a source of purified water from the filter having a lower total dissolved solids reading that the water being filtered (e.g., the purified water being filtered water from the reverse osmosis filter 1 that can remove up to 99% of the total dissolved solids from water), providing a secondary flow path allowing purified water into the filtered flow path (see FIG. 6), and flowing the purified water in the secondary flow path, wherein the secondary flow path allows the purified water to flow backwards through the filter for a predetermined interval to remove or

dissolve filtered media or unclog a filter in the primary flow path (see FIG. 6. and lines 35-49 of col. 14). Hisada et al fails to specify the steps of delivering filtered water to an end use device, a) switching an inlet valve, a drain valve, and a flush valve in a filtered flow path from a primary flow path used for dispensing operations to a secondary flow path, therein and c) switching the inlet valve, the drain valve, and the flush valve from the secondary flow path to the primary flow path to resume the delivery of filtered water to an end use device. McGowan discloses a method of backwashing a filter including the steps of delivering filtered water to an end use device in the form "outside systems" (see lines 15-18 of col. 4, a) switching an inlet valve 22, a drain valve 46, and a flush valve ~~36~~ 42 in a filtered flow path from a primary flow path to a secondary flow path, therein and c) switching the inlet valve 22, the drain valve 46, and the flush valve ~~36~~ 42 from the secondary flow path to the primary flow path to resume the delivery of filtered water to the end use device (see FIG. 1.). McGowan teaches that such a method allows use of the filter water as well as operation of the filter system from a single pneumatic control panel 24. It would have been obvious to have modified the method of Hisada et al so as to have included the method steps of switching an inlet valve, a drain valve, and a flush valve as suggested by McGowan in order to enable use of the filtered water as well as operation of the filter system from a single pneumatic control panel.

Concerning claim 37, McGowan discloses repeating steps c-e to provide continued cleansing of the filter medium (see from line 60 of col. 3 to line 3 of col. 5).

As to claim 39, Hisada et al discloses purified water having a total dissolved solids reading of at least 50% less than the water being filtered since a reverse osmosis

filter can remove up to 99% dissolved minerals from water.

Concerning claim 40, Hisada et al discloses backwashing the filter with purified water (e.g., permeate, see FIG. 6 and lines 35-49 of col. 14).

(10) Response to Argument

Applicant argues in the first full paragraph of page 5 and the second full paragraph of page 10 of the brief that the examiner inappropriately uses the terms "filter" and "membrane" interchangeably in the rejections of claims 1 and 36, however, it is held that the term "filter" is broad enough to encompass the term "membrane" in the case that the filter can remove particles on a molecular level.

Applicant argues in the second full paragraph of page 5 that filters are only capable of removing suspended particles over a predetermined size range and do not remove dissolved solids in a fluid, however, it is held that a filter in the form of a reverse osmosis membrane filter such as the type disclosed by Hisada is capable of both removing dissolved and un-dissolved solids from water. Applicant should note that "particles over a predetermined size range" is broad enough to read upon particles in the form of dissolved solids.

Applicant argues in the paragraph spanning pages 6-7 and the first full paragraph of page 8 that the combination of Hisada and McGowan fails to read on applicant's invention as claimed in instant claims 1 and 36 since Hisada delivers "purified water" as opposed to "filtered water" to an "end use device", however, it is held that the combination reads on claim 1 since "purified water" can be considered "filtered water" produced by the reverse osmosis membrane filter disclosed by Hisada. Applicant's

argument that the instant invention does not alter the total dissolved solids reading of filtered water delivered to the end use device fails to apply since such a limitation fails to appear anywhere in the instant specification or claims 1 and 36. The most relevant disclosure concerning the definition of term "filter" is the section "Description of the Related Art" on page 2 of the instant specification which states:

> "Water quality issues may be addressed through water treatment equipment that employ methods for purifying water, some in conjunction with others, to obtain a desired grade or level of water quality. Example water treatment methods include reverse osmosis, deionization, and steam generation. Water treatment equipment employing these methods typically require a filter in line prior thereto to remove particles up to a pre-selected range."

Accordingly, the description of the related art does not positively define the term "filter" as excluding structures that are capable of removing dissolved solids since the applicant's related art definition of a filter being a structure that can "remove particles up to a pre-selected range" is broad enough to incorporate filters capable of removing particles that are small enough to be in a dissolved state within water.

Applicant argues on page 7-8 of the brief that the U.S. Manual of Classification specifies a difference between the terms "filters" and "membranes", however, the manual clearly implies that a membrane is a form of filter that can retain dissolved or suspended matter from a liquid (see the definition of 210/650, "<u>Filtering</u> through a membrane"). Likewise, 210/348 includes patents claiming membrane filters (see U.S. Patent 6,669,905).

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of: Robert S. Bosko	§	Atty. Docket No: L-0170.96
Application No: 10/606,873	§	Examiner: M. Savage
Filed: June 26, 2003	§	Group Art Unit: 1724
For: METHOD AND APPARATUS FOR A WATER FILTER BACKFLUSH	§	

APPEAL BRIEF

MAIL STOP APPEAL BRIEF - PATENTS
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Sir:

Applicant timely presents its Brief on Appeal for the referenced application.

09/08/2006 AWONDAF1 00000045 10606873

01 FC:1402 500.00 OP

REAL PARTY IN INTEREST

The real party in interest is Lancer Partnership, Ltd., a Texas limited liability partnership, having a business address of 6655 Lancer Blvd., San Antonio, Texas 78219

RELATED APPEALS AND INTERFERENCES

There are no related appeals and interferences of which Applicant is aware.

STATUS OF THE CLAIMS

Claims 1-3, 5-8, 36-38, and 40-42 remain in the referenced application. Claims 4 and 39 have been canceled. Claims 9-35 have been withdrawn from consideration, and are canceled. Claims 1-3, 5-8, 36-38, and 40-42 stand rejected under 35 U.S.C. §103(a) by Hisada (U.S. Patent 6,190,557 B1, hereinafter referred to as Hisada) in view of McGowan (U.S. Patent No. 6,562,246, hereinafter referred to as McGowan). Applicant is appealing the rejections of Claims 1-3, 5-8, 36-38, and 40-42.

STATUS OF AMENDMENTS

Applicant's Amendment "B" dated January 25, 2006, was entered into the referenced application. Applicant's Amendment After Final dated June 5, 2006 has not been entered into the referenced application for the purposes of this Appeal.

SUMMARY OF CLAIMED SUBJECT MATTER

The claimed subject matter entails methods for backflushing a filtration device with purified water. Filtration devices in this disclosure include filters that remove particles up to a preselected size range (see page 2, lines 15-16). Purified water includes water having a lower total dissolved solids reading than the water being filtered, preferably with a total dissolved solids reading fifty percent lower than that of the water being filtered, more preferably with a total dissolved solids reading eighty percent lower than that of the water being filtered, and still,

more preferably, with a total dissolved solids reading ninety five percent lower than that of the water being filtered. Those skilled in the art will recognize that purified water may be produced using any suitable purification process, such as reverse osmosis, steam distillation, or deionization. Backflushing of a filtration device allows the backflush media to lift compacted particles (see page 5, lines 4-12, in light of Figure 1). In the simplest form, purified water is used to rinse or backflush a filter or filter cartridge (see page 4, lines 19-20, in light of Figures 1 and 2). Further embodiments include a pressurized flow and a submersing tank to backflush or submerge a filter in purified water (see page 5, lines 21-23, in light of Figures 1, 2 and 3). Water with a low total dissolved solids reading is essentially unsaturated and able to dissolve particles attached to the filter medium. Various embodiments of the invention may be employed to extend the life of filters, unclog clogged filters or keep new filters from clogging. Backflushing of a filter may be accomplished manually or through an embodiment of this invention that automatically backflushes a filter on a scheduled basis. The particles are then removed from the filter medium through the use of a second flowpath terminating in a sanitary drain or other disposal.

An alternative method includes utilizing a primary or filtered flowpath used during normal operations (see page 6, lines 6-11, in light of Figure 3) and a secondary flowpath used for backflushing routines (see page 6, lines 12-18, and page 7, lines 1-2, in light of Figure 3), wherein purified water is the source water used for backflushing the filter (see page 8, lines 4-9, in light of Figure 3). Switching a set of valves substantially simultaneously provides the two separate and distinct flowpaths. The use of the secondary flowpath allows purified water to enter the primary flowpath, and move backwards through the filter. The water is then purged from the filtered flowpath to remove concentrations of solids that have been displaced from the filter by

the backflushing routine (see page 8, lines 10-23, in light of Figure 3, and page 9, lines 1-3). Switching of the valves may be accomplished manually (see page 8, lines 21-23, and page 9, lines 1-3, in light of Figures 4 and 5) or a controller (see page 9, lines 9-19, in light of Figure 6-7) may be added to the system to provide the capability of automatically backflushing the filter on a scheduled basis.

GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Whether claims 1-3, 5-8, 36-38, and 40-42 are patentable under 35 U.S.C. §103(a) over Hisada in view of McGowan.

ARGUMENTS

CLAIM 1

Claim 1 stands rejected under 35 U.S.C. §103(a) by Hisada (U.S. Patent 6,190,557 B1, hereinafter referred to as Hisada) in view of McGowan (U.S. Patent No. 6,562,246, hereinafter referred to as McGowan). The Examiner asserts that "Hisada discloses a method of cleansing a filter 1 including passing water from a water source through a filter producing filtered water (see lines 6-18 of col. 14), providing a source of purified water (e.g. filtered water from the permeate side of the reverse osmosis membrane (see Fig. 6 and lines 35-49 of col. 14)), the purified water having a lower total dissolved solids reading than the water being filtered since a reverse osmosis filter can remove up to 99% dissolved minerals from water, and exposing the filter to the purified water (e.g. via backwashing as shown in Fig. 6 with permeate)." In summary, the Examiner asserts that Hisada provides a filter that creates "purified water" that may be used to backflush the filter, and the Examiner has placed Hisada's filter into McGowan's device to create a backflush unit that produces purified water and backflushes with the purified water.

Applicant respectfully disagrees with the Examiner regarding the above-recited rejection.

Applicant's claim 1 recites, "passing water from a water source through a filter, thereby producing filtered water," for delivery to an end use device. Applicant respectfully contends that filters produce" filtered water." Applicant's third step of claim 1 recites, "providing a source of purified water, wherein the purified water has a lower total dissolved solids reading than the water being filtered." Applicant further respectfully contends that "purified water" must be produced by a "purification process." Applicant's fourth step of claim 1 recites, "exposing the filter to the purified water." As such, a filter is exposed to "purified water" made through a "purification process."

Applicant respectfully asserts that Hisada's invention is entitled, "SPIRAL WOUND TYPE MEMBRANE ELEMENT, RUNNING METHOD AND WASHING METHOD THEREOF," and therefore, Hisada must be teaching a purification membrane. Illustratively, the purification membrane is a reverse osmosis membrane. Applicant respectfully contends that the Examiner has inappropriately utilized the terms "filter" and Hisada's "spiral wound membrane element 1" interchangeably.

Applicant respectfully asserts that Applicant's invention is drawn to methods for cleansing a "filter" with a "purified water" source. Filters are commonly utilized in many technologies, and are capable of removing only suspended particles over a predetermined size, as filtering is a mechanical process, whereby the oversize suspended particles physically cannot move through the filtering component. Accordingly, filters provide an inexpensive means of removing sediments and other suspended debris, however, the filters build up deposits over time, and must be cleaned or replaced. Filters do not remove the dissolved solids in a fluid, as this happens at the ionic level (magnitudes smaller than the smallest orifices of a filtering component).

Applicant's invention is drawn to cleansing a filter with "purified water." Applicant respectfully asserts that Applicant has defined "purified water" in Applicant's specification as, "water having a lower total dissolved solids reading than the water being filtered, preferably with a total dissolved solids reading fifty percent lower than that of the water being filtered, more preferably with a total dissolved solids reading eighty percent lower than that of the water being filtered, and still more preferably with a total dissolved solids reading ninety five percent lower than that of the water being filtered." Applicant has further stated in the specification that, "purified water may be produced using any suitable purification process, such as reverse osmosis, steam distillation or deionization."

Applicant's invention teaches cleansing Applicant's filter with "purified water," as defined in Applicant's specification. Applicant's invention further teaches a "filtered flowpath" that delivers "filtered water" to an end use device, as shown in Figure 1 of Appendix A. As filters are incapable of removing dissolved solids from the water, in Applicant's invention, the total dissolved solids reading (TDS) of the water being filtered is substantially identical to the total dissolved solids reading of the "filtered water" that is delivered to the end use device. Conversely, in Hisada in view of McGowan, the total dissolved solids reading of the water prior to the separation membrane, herein represented with an amount equivalent to that shown in Applicant's summary sketch of Figure 1, as TDS = A, and suspended particles = X, is reduced to TDS < A, and suspended particles < X, after passing through Hisada's separation membrane. Accordingly, in the Examiner's quest to reconstruct the Applicant's invention, the Examiner has inadvertently altered the Applicant's invention, as well as the type of fluid delivered to Applicant's end use devices. Accordingly, Applicant respectfully asserts that the Examiners combination clearly does not read on the Applicant's invention, as the Examiner's combination

fails to create the Applicant's invention. Applicant's invention does not alter the total dissolved solids reading of the filtered water delivered to end use devices, and Hisada in view of McGowan clearly alters the total dissolved solids reading of the water passing through Hisada's membrane, thereby delivering "purified water" to end use devices. One of ordinary skill in the art will readily recognize that there is a difference between water having a high total dissolved solids reading and water having a low total dissolved solids reading, and accordingly, the United States Patent and Trademark Office has separate classifications for them, specifically subclasses 348 Filters and 652 Hyperfiltration.

As Applicant's arguments have not been persuasive in previous amendments, Applicant is presenting additional materials that explicitly reinforce Applicant's arguments. As presented in Appendix B, Class 210 of the Manual of Patent Classification, United States Patent and Trademark Office, is entitled, "LIQUID PURIFICATION OR SEPARATION," and includes subclasses: 348 Filters and 652 Hyperfiltration (e.g. reverse osmosis, etc.). The CLASSIFICATION DEFINITIONS for each subclass as presented by the United Stated Patent and Trademark Office are provided in Appendix B, and below, as follows:

348 This subclass is indented under the class definition. Apparatus in which constituents of a prefilt (usually solids and liquid) are separated by passing the prefilt through a medium having openings which retain at least one constituent.

650 Filtering through membrane (e.g., ultrafiltration): This subclass is indented under subclass 649. Process in which a liquid is passed through a skinlike barrier which serves to retain dissolved or colloidally suspended matter, passing only those constituents which are, per se, fluid, e.g., solvent.

652 Hyperfiltration (e.g., reverse osmosis, etc.): This subclass is indented under

subclass 650. Process in which dissolved material (i.e., including ionic) is removed from a liquid. (1) Note. Reverse osmosis is the usual process for which this subclass provides. See OSMOSIS under the GLOSSARY.

In reviewing the class and subclass definitions, it is clearly evident that differences exist between filters and purification membranes. Filters merely separate out based upon size, and do not alter the total dissolved solids makeup of the liquid, as this process must occur on the molecular level. Alternatively, purification membranes (subclass 650) "retain dissolved or colloidially suspended matter, passing only those constituents which are per se, fluid." Accordingly, Applicant expressly recites that the Examiner's combination of Hisada in view of McGowan clearly alters the total dissolved solids reading as it filters the water, thereby delivering purified water to end use devices. Applicant respectfully asserts that the combination of Hisada in view of McGowan is improper, as the combination clearly alters the total dissolved solids reading of the water passing through Hisada's membrane. Applicant delivers "filtered water" to Applicant's end use device, not "purified water." The delivery of "purified water" to the end use device is markedly different than the delivery of "filtered water" to the end use device. Applicant respectfully asserts that Applicant's arguments do have merit, and should be persuasive, as Applicant's invention is designed to deliver "filtered water" to Applicant's end use devices. Accordingly, Applicant respectfully asserts that Applicant's claim 1 is patentable over Hisada in view of McGowan, and respectfully requests that the rejections of claim 1 under 35 U.S.C. §103(a) be withdrawn.

<u>CLAIM 2</u>

Claim 2 stands rejected under 35 U.S.C. §103(a) as being anticipated by Hisada in view of McGowan. Applicant respectfully asserts that the patentability of claim 2 lies with the

patentability of claim 1.

CLAIM 3

Claim 3 stands rejected under 35 U.S.C. §103(a) as being anticipated by Hisada in view of McGowan. Applicant respectfully asserts that the patentability of claim 3 lies with the patentability of claim 1.

CLAIM 5

Claim 5 stands rejected under 35 U.S.C. §103(a) as being anticipated by Hisada in view of McGowan. Applicant respectfully asserts that the patentability of claim 5 lies with the patentability of claim 1.

CLAIM 6

Claim 6 stands rejected under 35 U.S.C. §103(a) as being anticipated by Hisada in view of McGowan. Applicant respectfully asserts that the patentability of claim 6 lies with the patentability of claim 1.

CLAIM 7

Claim 7 stands rejected under 35 U.S.C. §103(a) as being anticipated by Hisada in view of McGowan. Applicant respectfully asserts that the patentability of claim 7 lies with the patentability of claim 1.

CLAIM 8

Claim 8 stands rejected under 35 U.S.C. §103(a) as being anticipated by Hisada in view of McGowan. Applicant respectfully asserts that the patentability of claim 8 lies with the patentability of claim 1.

CLAIM 36

Claim 36 stands rejected under 35 U.S.C. §103(a) by Hisada in view of McGowan. The Examiner asserts that Hisada discloses a method for backflushing a filter including flowing water from a water source 51 (Figure 4) through a primary flowpath in a filtered flowpath 52, providing a source of purified water from the filter having a lower total dissolved solids reading than the water being filtered (e.g. Hisada's filter is a Reverse Osmosis membrane that removes up to 99% of the total dissolved solids from water), providing a secondary flowpath allowing purified water into the filtered flowpath (Figure 6), and flowing the purified water in the secondary flowpath, wherein the secondary flowpath allows the purified water to flow backwards through the filter for a predetermined interval to remove or dissolve filtered media or unclog a filter in the primary flowpath (see Figure 6, and lines 35-49 of col. 14).

Applicant respectfully disagrees with the Examiner's rejection, because the Examiner has utilized the terms, "filter" and "purification membrane" interchangeably, and therefore has substituted "filtered water" with "purified water." Applicant has distinguished between "filtered water" and "purified water" in the specification. As recited in the specification, "Example water treatment methods include reverse osmosis, deionization, and steam generation. Water treatment employing these methods typically require a filter in line prior thereto to remove particles up to a preselected size range," (page 2, lines 14-16). Applicant has attempted to clarify the method steps of Applicant's claim 36 to distinguish between "filtered water" and "purified water." Applicant respectfully asserts that the arguments for claim 1 regarding the differences between "filtered water" and "purified water" are pertinent to claim 36.

The first step of claim 36 recites, "flowing water from a water source through a primary flowpath in a filtered flowpath to an end use device, thereby delivering filtered water to the end

use device." As described in the arguments for claim 1, Hisada in view of McGowan delivers "purified water" to an end use device. Applicant respectfully contends that "purified water" is different than "filtered water," as previously argued in the total dissolved solids argument of claim 1, and therefore, Hisada in view of McGowan does not disclose the first step of claim 36 that delivers "filtered water" to the end use device.

The second step of claim 36 recites, "providing a source of purified water, wherein the purified water has a lower total dissolved solids reading than the water being filtered." At this point, Applicant's first step of claim 36 provides a filtered flowpath (through the use of a filter), and a separate purified water source (water made through the use of a purification process). Hisada in view of McGowan creates "purified water" and backflushes Hisada's filter (really a purification membrane) with "purified water". As such, Hisada in view of McGowan delivers "purified water" to the end use device. Applicant's invention delivers "filtered water" to Applicant's end use device.

The third and fourth steps of claim 36 provide for switching from a primary flowpath to a secondary flowpath that allows "purified water" from the purified water source to enter the primary flowpath, and move backwards through the filter, thereby providing a cleansing feature. The final step provides for switching back to the primary flow path "to resume the delivery of filtered water to the end use device." As such, the fifth step of Applicant's invention is not disclosed by Hisada in view of McGowan, because, Hisada in view of McGowan delivers "purified water" to the end use device. As previously argued, "filtered water" is markedly different from "purified water." Accordingly, Applicant respectively asserts that claim 36 is patentable over Hisada in view of McGowan, and respectfully requests that the rejection of claim 36 under 35 U.S.C. §103(a) be withdrawn.

CLAIM 37

Claim 37 stands rejected under 35 U.S.C. §103(a) as being anticipated by Hisada in view of McGowan. Applicant respectfully asserts that the patentability of claim 37 lies with the patentability of claim 36.

CLAIM 38

Claim 38 stands rejected under 35 U.S.C. §103(a) as being anticipated by Hisada in view of McGowan. Applicant respectfully asserts that the patentability of claim 38 lies with the patentability of claim 36.

CLAIM 40

Claim 40 stands rejected under 35 U.S.C. §103(a) as being anticipated by Hisada in view of McGowan. Applicant respectfully asserts that the patentability of claim 40 lies with the patentability of claim 36.

CLAIM 41

Claim 41 stands rejected under 35 U.S.C. §103(a) as being anticipated by Hisada in view of McGowan. Applicant respectfully asserts that the patentability of claim 41 lies with the patentability of claim 36.

CLAIM 42

Claim 42 stands rejected under 35 U.S.C. §103(a) as being anticipated by Hisada in view of McGowan. Applicant respectfully asserts that the patentability of claim 42 lies with the patentability of claim 36.

In view of the foregoing, Applicant respectfully requests the Final Rejection of the Examiner dated January 25, 2006, be reversed.

Respectfully submitted,

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DATE: 6 September 2006 BY: ______________________
Christopher L. Makay
Reg. No. 34,475

ATTORNEY FOR APPLICANT

CERTIFICATE OF MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service "Express Mail Post office to Addressee" service under 37 CFR 1.10 on the dated indicated below, addressed to the Commissioner for Patents, P.O. Box 1450, Arlington, VA 22313-1450.

Express Mail No. EV847630377US Date: 6 September 2006

____
John Vira

CLAIMS APPENDIX

Claim 1 (previously presented): A method of cleansing a filter, comprising:

passing water from a water source through a filter, thereby producing filtered water;

delivering the filtered water to an end use device;

providing a source of purified water, wherein the purified water has a lower total dissolved solids reading than the water being filtered; and

exposing the filter to the purified water.

Claim 2 (original): The method of claim 1, wherein the filter includes a filter cartridge.

Claim 3 (original): The method of claim 1, wherein the purified water includes water treated by a reverse osmosis, a steam distillation or a deionization process.

Claim 4 (canceled).

Claim 5 (original): The method of claim 1, wherein the purified water has a total dissolved solids reading at least fifty percent less than water being filtered.

Claim 6 (original): The method of claim 1, wherein the purified water has a total dissolved solids reading at least eighty percent less than water being filtered.

Claim 7 (original): The method of claim 1, wherein the purified water has a total dissolved solids reading at least ninety five percent less than water being filtered.

Claim 8 (previously presented): The method of claim 1, further comprising~~:~~ backflushing the filter with the purified water.

Claims 9-35 (canceled).

Claim 36 (previously presented): A method for backflushing a filter, comprising:

a. flowing water from a water source through a primary flowpath in a filtered flowpath to an end use device, thereby delivering filtered water to the end use device;

b. providing a source of purified water, wherein the purified water has a lower total dissolved solids reading than the water being filtered;

c. switching an inlet valve, a drain valve, and a flush valve in the filtered flowpath from the primary flowpath to a secondary flowpath that allows purified water into the filtered flowpath;

d. flowing the purified water into the secondary flowpath, wherein the secondary flowpath allows the purified water to flow backwards through the filter for a predetermined interval to remove or dissolve filtered media or unclog a filter in the primary flowpath; and

e. switching the inlet valve, the drain valve, and the flush valve from the secondary flowpath to the primary flowpath to resume the delivery of filtered water to the end use device.

Claim 37 (previously presented): The method for backflushing a filter as recited in claim 36, further comprising:

d. repeating steps c.-e. to provide a continued cleansing of the filter.

Claim 38 (original): The method of claim 36, wherein the purified water includes water treated by a reverse osmosis, a steam distillation or a deionization process.

Claim 39 (canceled).

Claim 40 (original): The method of claim 36, wherein the purified water has a total dissolved solids reading at least fifty percent less than water being filtered.

Claim 41(original): The method according to claim 36, wherein the purified water has a total dissolved solids reading at least eighty percent less than water being filtered.

Claim 42 (original): The method of claim 36, wherein the purified water has a total dissolved solids reading at least ninety five percent less than water being filtered.

Evidence Appendix

Applicant has provided Appendix A and Appendix B for entry into the Evidence Appendix.

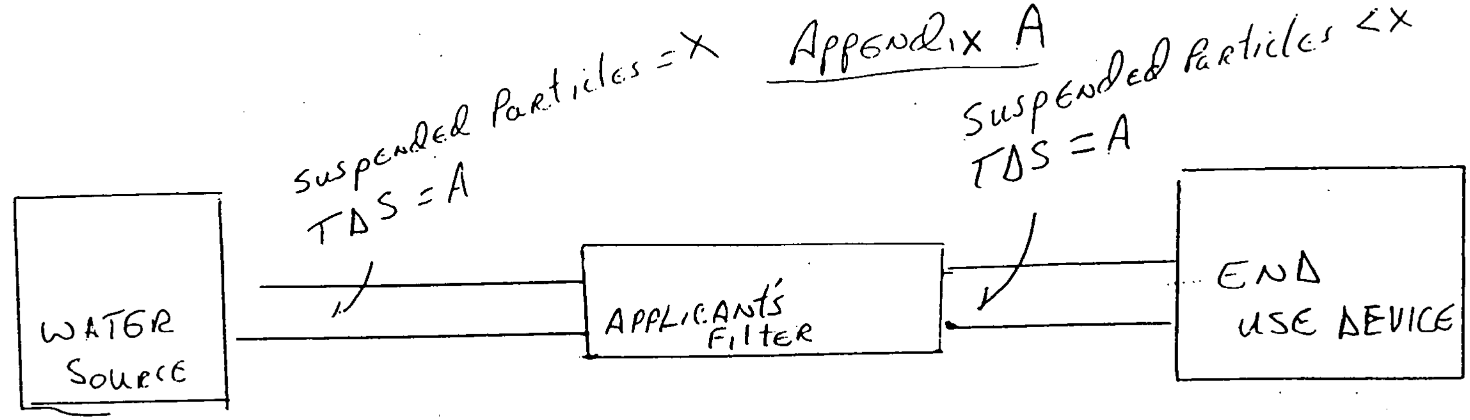
Appendix A

Figure 1 provides a comparison of the Applicant's invention and Hisada in view of McGowan with respect to the condition of fluid delivered to respective end use devices.

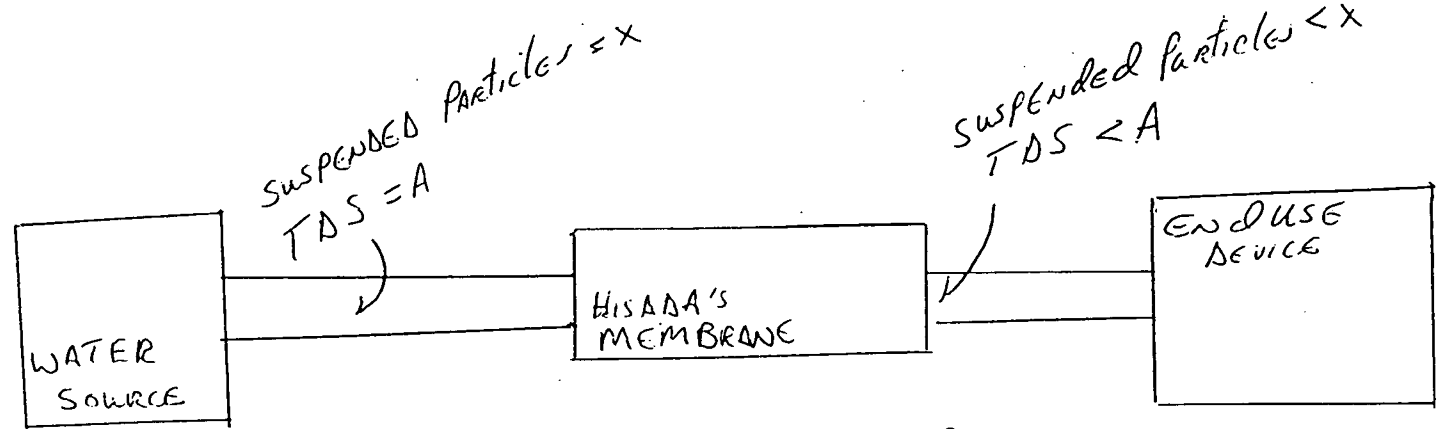
Appendix B

Appendix B provides copies of the United States Patent and Trademark Office patent classification definitions for classes 348, 650, and 652.

Appendix A



Applicant's Invention



HISADA inview of McGowan

Fig. 1

342 This subclass is indented under subclass 323.1. Apparatus wherein the filter units are arranged one within another.

SEE OR SEARCH THIS CLASS, SUBCLASS:

315, for spaced diverse filters, one within another.

337+, for nested filter units arranged for series prefilt flow.

343 This subclass is indented under subclass 323.1. Apparatus in which the units alternate with liquid receivers, alternate receivers acting respectively as liquid inlet and discharge means, at least one of a pair of liquid receivers separating one filter medium from another and contacting the separated filter mediums on opposite faces.

SEE OR SEARCH THIS CLASS, SUBCLASS:

417, for similar devices in which the alternate liquid receivers are located within a continuous body of filter medium.

344 This subclass is indented under subclass 323.1. Apparatus in which each filter unit comprises a filter medium and an imperforate pan-like liquid receiver substantially coextensive with the filter medium.

SEE OR SEARCH THIS CLASS, SUBCLASS:

224, for a sectional chamber press type filter.

492, for stacked dissimilar elements, the entire stack forming a single unit.

345 This subclass is indented under subclass 323.1. Apparatus in which the units are radially arranged or which are connected to means extending radially from a central header.

346 This subclass is indented under subclass 323.1. Apparatus in which the units each comprise a filter medium enclosing a space, the filter medium having separate or distinct walls.

SEE OR SEARCH THIS CLASS, SUBCLASS:

331, for similar structure among movable elements.

486+, for a spaced wall type filter unit.

492, for filter elements divided into alternate prefilt and filtrate spaces by alternately arranged dissimilar elements.

347 This subclass is indented under subclass 346. Apparatus in which there is a header extending centrally of the group of spaced wall type filter elements.

348 This subclass is indented under the class definition. Apparatus in which constituents of a prefilt (usually solids and liquid) are separated by passing the prefilt through a medium having openings which retain at least one constituent.

SEE OR SEARCH CLASS:

4, Baths, Closets, Sinks, and Spittoons, subclass 286 for strainers specialized for that class.

55, Gas Separation, appropriate subclasses beginning with subclass 474 for gas filters.

166, Wells, subclasses 227+ for screens peculiar to wells.

209, Classifying, Separating, and Assorting Solids, subclasses 233+ for sifters for solid material.

349 This subclass is indented under subclass 348. Apparatus provided with means dampening pulsations in liquid flow or for trapping a gas, usually air.

SEE OR SEARCH THIS CLASS, SUBCLASS:

410, for a device which traps a gas and then releases it to blowback a filter medium.

350 This subclass is indented under subclass 348. Apparatus in which a filter medium is enclosed by a receptacle and provided with adjustable or movable means to compress the filtering material.

SEE OR SEARCH THIS CLASS, SUBCLASS:

226, for a sectional pressure type filter and porous filler.

of withdrawing from, or returning to, the body such a fluid.
260, Chemistry of Carbon Compounds, appropriate subclass for a method of obtaining an organic compound from a biological fluid.
424, Drug, Bio-Affecting and Body Treating Compositions, for a composition comprising a biological fluid for treating a body and a process of making such a composition.
436, Chemistry: Analytical and Immunological Testing, subclasses 1+ for a method of testing or analysing a biological fluid.

646 **Hemodialysis:**
This subclass is indented under subclass 645. Process in which blood is treated or purified.

(1) Note. The process generally duplicates the function of the kidney.

SEE OR SEARCH CLASS:
128, Surgery, for a method of treating blood and a significant step of withdrawing from or returning to a living body the blood being treated.
422, Chemical Apparatus and Process Disinfecting, Deodorizing, Preserving, or Sterilizing, subclasses 44+ for blood oxygenating apparatus; however, combined blood purifying and oxygenating apparatus is in this class (210).
435, Chemistry: Molecular Biology and Microbiology, subclass 2 for a process of oxygenating blood, but the combined process of purifying and oxygenating blood is classifiable in this class (210).

647 **Maintaining critical concentration(s):**
This subclass is indented under subclass 646. Process in which the amount of at least one constituent of the treated fluid is kept at or between predetermined limits.

(1) Note. The concentration of either the constituent it is desired to remove or of some other constituent is included, e.g., maintaining the potassium level in an artificial kidney process.

648 **Including regenerating or rehabilitating the extracting liquid in liquid/liquid solvent or colloidal extraction:**
This subclass is indented under subclass 644. Process in which the liquid into which a constituent has migrated from the treated liquid is itself treated to remove such constituent and thereby placed in condition for reuse.

(1) Note. The extracting liquid is sometimes referred to as the dialysizing liquid and usually is recycled.

649 **Diffusing or passing through septum selective as to material of a component of liquid:**
This subclass is indented under subclass 634. Process in which a constituent of a liquid migrates through a skinlike partition as set forth in the Glossary under Semipermeable membrane.

(1) Note. The process provided for in this subclass is more than filtration or screening to a very fine stage, but includes diffusion of usually a solvent through a material based on the chemical potential of the various materials of the liquid and membrane. A rather complete treatment of the process is given in Kirk-Othmer Encyclopedia of Chemical Technology-Dialysis-Vol. 7 pp. 1-21; and Osmosis, Osmotic Pressure and Reverse Osmosis-Vol. 14, pp. 345-355.

650 **Filtering through membrane (e.g., ultrafiltration):**
This subclass is indented under subclass 649. Process in which a liquid is passed through a skinlike barrier which serves to retain dissolved or colloidally suspended matter, passing only those constituents which are, per se, fluid, e.g., solvent.

(1) Note. For placement in this subclass, some, but not all, dissolved matter must be retained, e.g., a solute such as protein, soluble synthetic resins or starch may be retained while ionized salts may pass through the membrane. Retention of ionized material is provided for in indented subclasses 652+.

16-B2

651 **Removing specified material:**
This subclass is indented under subclass 650. Process in which a constituent removed from the liquid is positively identified.

(1) Note. The material itself rather than a characteristic must be identified. For example, oily material, and food waste, or organic are not considered to be identified material; however, protein and named bacteria are considered to be specified material.

652 **Hyperfiltration (e.g., reverse osmosis, etc.):**
This subclass is indented under subclass 650. Process in which dissolved material (i.e., including ionic) is removed from a liquid.

(1) Note. Reverse osmosis is the usual process for which this subclass provides. See OSMOSIS under the GLOSSARY.

653 **Utilizing specified membrane material:**
This subclass is indented under subclass 652. Process reciting named membrane material.

SEE OR SEARCH THIS CLASS, SUBCLASS:

641, for a process using diverse membranes.

654 **Synthetic resin:**
This subclass is indented under subclass 653. Process in which the membrane is constructed of a manufactured polymeric material exhibiting properties similar to those of a natural resin (e.g., film forming).

(1) Note. Synthetic resins, per se, are classified in Class 260, Chemistry of Carbon Compounds, subclasses 201+ (including the 520 series of classes).

655 **Cellulosic:**
This subclass is indented under subclass 653. Process in which the membrane is constituted of a naturally occurring polymeric carbohydrate, usually derived from wood, cotton, or flax.

656 **Chromatography:**
This subclass is indented under subclass 600. Process in which a solid sorbent competes in affinity with a relatively moving carrier liquid or solvent for a constituent such that the constituent is moved through the sorbent at a rate slower than the liquid and determined by the equilibrium or partition coefficient of the liquid-sorbent combination.

(1) Note. The process may separate more than one constituent with different partition coefficients, selectively spacing said constituents in consequence of the differing equilibria in the constituent liquid-sorbent combinations.

(2) Note. The processes provided for in subclasses 633, 634+, 656+, and 660+ utilize similar functions based on relative attraction or repellancy of materials and an explanation of the distinction between the concepts of subclasses 633 and 634+ on the one hand and subclasses 656+ and 660+ on the other hand, is given in the definition of subclass 634.

(3) Note. A process in which a liquid or organic gel acts as a sorbent is a liquid/liquid solvent extraction process and a patent to such a process will be placed in subclass 635. The organic gels exhibit a resilient or plastic property indicative of the underlying liquid nature. Silica gel (inorganic) which has the characteristic of a solid granular mass is not a gel-type sorbent for that subclass (635) and a process using silica gel is classifiable in this or an indented subclass.

SEE OR SEARCH THIS CLASS, SUBCLASS:

635, for a liquid/liquid or gel-type chromatography, such as partition chromatography process, and see (2) Note supra.

SEE OR SEARCH CLASS:

73, Measuring and Testing, subclasses 19.02, 23.35+ and 61.43 for a test involving chromatography.

95, Gas Separation: Processes, subclasses 82+ for processes of gas separation using chromatography.

16-B3

Related Proceedings Appendix

There are no related proceedings cited in this Appeal Brief.

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/606,873	06/26/2003	Robert S. Bosko	L-0170.96	5255

41418 7590 04/06/2006

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EXAMINER	
SAVAGE, MATTHEW O	
ART UNIT	**PAPER NUMBER**
1724	

DATE MAILED: 04/06/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

Office Action Summary	Application No. 10/606,873	Applicant(s) BOSKO, ROBERT S.	
	Examiner Matthew O. Savage	Art Unit 1724	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 25 January 2006.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-3,5-8,36-38 and 40* is/are pending in the application.

4a) Of the above claim(s) *2,6,7,38,41 and 42* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1, 2, 5, 8, 36, 37, and 40* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1, 2, 5, 8, 36, 37, and 40 are rejected under 35 U.S.C. 103(a) as being unpatentable over in Hisada et al view of McGowan.

With respect to claim 1, Hisada et al discloses a method of cleansing a filter 1 including passing water from a water source through a filter producing filtered water (see lines 6-18 of col. 14), providing a source of purified water (e.g., filtered water from the permeate side of the reverse osmosis membrane, see FIG. 6 and lines 35-49 of col. 14), the purified water having a lower total dissolved solids reading than the water being filtered since a reverse osmosis filter can remove up to 99% dissolved minerals from water, and exposing the filter to the purified water (e.g., via backwashing as shown in FIG. 6 with the permeate). Hisada et al fail to specify delivering the filtered water to an end use device. McGowan discloses the concept of delivering a filtered fluid to an end use device in the form of "outside systems" via conduit 26 and valve 36 (see lines 15-18 of col. 4) and teaches that such a step enables use of the filtered water. It would have been obvious to have modified the method of Hisada et al so as to have included the step of delivering the filtered water to an end use device as suggested by Hisada et al in order to make use of the filtered water.

Concerning claim 2, Hisada et al discloses a filter cartridge 1.

As to claim 5, Hisada et al discloses purified water having a total dissolved solids reading of at least 50% less than the water being filtered since a reverse osmosis filter can remove up to 99% dissolved minerals from water.

Concerning claim 8, Hisada et al discloses backwashing the filter with purified water (e.g., permeate, see FIG. 6 and lines 35-49 of col. 14).

With respect to claim 36, Hisada et al disclose a method for back flushing a filter 1 including flowing water from a water source 51 (see FIG. 4) through a primary flowpath in a filtered flow path 52, providing a source of purified water from the filter having a lower total dissolved solids reading that the water being filtered (e.g., the purified water being filtered water from the reverse osmosis filter 1 that can remove up to 99% of the total dissolved solids from water), providing a secondary flow path allowing purified water into the filtered flow path (see FIG. 6), and flowing the purified water in the secondary flow path, wherein the secondary flow path allows the purified water to flow backwards through the filter for a predetermined interval to remove or dissolve filtered media or unclog a filter in the primary flow path (see FIG. 6. and lines 35-49 of col. 14). Hisada et al fails to specify the steps of delivering filtered water to an end use device, a) switching an inlet valve, a drain valve, and a flush valve in a filtered flow path from a primary flow path used for dispensing operations to a secondary flow path, therein and c) switching the inlet valve, the drain valve, and the flush valve from the secondary flow path to the primary flow path to resume the delivery of filtered water to an end use device. McGowan discloses a method of backwashing a filter including

the steps of delivering filtered water to an end use device in the form "outside systems" (see lines 15-18 of col. 4, a) switching an inlet valve 22, a drain valve 46, and a flush valve 36 in a filtered flow path from a primary flow path to a secondary flow path, therein and c) switching the inlet valve 22, the drain valve 46, and the flush valve 36 from the secondary flow path to the primary flow path to resume the delivery of filtered water to the end use device (see FIG. 1.). McGowan teaches that such a method allows use of the filter water as well as operation of the filter system from a single pneumatic control panel 24. It would have been obvious to have modified the method of Hisada et al so as to have included the method steps of switching an inlet valve, a drain valve, and a flush valve as suggested by McGowan in order to enable use of the filtered water as well as operation of the filter system from a single pneumatic control panel.

Concerning claim 37, McGowan discloses repeating steps c-e to provide continued cleansing of the filter medium (see from line 60 of col. 3 to line 3 of col. 5).

As to claim 39, Hisada et al discloses purified water having a total dissolved solids reading of at least 50% less than the water being filtered since a reverse osmosis filter can remove up to 99% dissolved minerals from water.

Concerning claim 40, Hisada et al discloses backwashing the filter with purified water (e.g., permeate, see FIG. 6 and lines 35-49 of col. 14).

Applicant's arguments filed 1-25-06 have been fully considered but they are not persuasive.

Applicant argues that Hisada et al fails to disclose backwashing a filter with purified water, however, it is held that Hisada et al discloses such a step since the reference teaches backwashing a reverse osmosis membrane/filter with permeate, the permeate being considered filtered/purified water since it has a lower total dissolved solids content than the water being filtered.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Matthew O Savage whose telephone number is (571) 272-1146. The examiner can normally be reached on Monday-Friday, 7:00am-3:30pm.

Matthew Savage
Matthew O Savage
Primary Examiner
Art Unit 1724

mos
April 5, 2006

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION FOR UNITED STATES LETTERS PATENT

INVENTION:

METHOD AND APPARATUS FOR A WATER FILTER BACKFLUSH

INVENTOR:

ROBERT S. BOSKO

CERTIFICATE OF EXPRESS MAIL

I hereby certify that the foregoing documents are being deposited with the United States Postal Service as Express Mail, postage prepaid, in an envelope addressed to the Assistant Commissioner of Patents, Washington D.C. 20231.

Express Mail No. ER 276075185 US

Date 26 June 2003

Christopher L. Makay

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a method and apparatus for backflushing a water filter and, more particularly, but not by way of limitation, to backflushing the water filter with pure water.

2. Description of the Related Art

Water of sufficient quality for human consumption has always been a concern, especially in newly developing countries, and there is a growing concern even in industrialized countries. Water quality issues range from merely reducing water hardness or removing high concentrations of minerals to the dire one of removing contaminants, such as biological or harmful chemicals.

Water quality issues may be addressed through water treatment equipment that employ various methods for purifying water, some in conjunction with others, to obtain a desired grade or level of water quality. Example water treatment methods include reverse osmosis, deionization and steam generation. Water treatment equipment employing these methods typically require a filter in line prior thereto to remove particles up to a preselected size range.

Unfortunately, filters typically have a limited life and are treated as consumables. Filters commonly used in the marketplace contain a filter cartridge that is replaceable. Therein, a service agent or maintenance person must remove and replace the filter cartridge on a scheduled basis. When new, the filter cartridges allow water to pass freely, with minimal pressure buildup. As the filtering process continues, the flow through the filter is reduced due to clogging, calcification and compaction due to continued pressure. Problems with servicing of filters include varying levels of clogging associated with different types of water, as well as varying levels of service available in different areas. In remote or less populated areas, access to service

agents is limited. Consequently, the use of filters in a water delivery system can be cost prohibitive and inefficient.

SUMMARY OF THE INVENTION

In accordance with the present invention, a method and corresponding apparatus employ purified water to backflush a filtration device. Purified water includes water having a total dissolved solids reading less than that of the water being filtered, preferably at least fifty percent less. In the simplest form, purified water is used to rinse or backflush a filter or filter cartridge. Further embodiments include a pressurized flow and a submersing tank to backflush or submerge a filter .

An alternative embodiment includes a primary or filtered flowpath used during normal operations and a secondary flowpath used for backflushing routines, wherein purified water is the source water used for backflushing the filter. Switching a set of valves substantially simultaneously provides the two separate and distinct flowpaths. The use of the secondary flowpath allows purified water to enter the primary flowpath, and move backwards through the filter. The water is then purged from the filtered flowpath to remove concentrations of solids that have been displaced from the filter by the backflushing routine. Switching of the valves may be accomplished manually or a controller may be added to the system to provide the capability of automatically backflushing the filter on a scheduled basis.

It is therefore an object of the present invention to utilize purified water as a cleansing media.

It is a further object of the present invention to provide an apparatus for cleansing a filter using purified water.

It is still further an object of the present invention to provide an apparatus for backflushing a filter in a filtered flowpath using purified water.

It is still yet further an object of the present invention to provide an apparatus for automatically backflushing a filter in a filtered flowpath on a scheduled basis.

It is still yet further an object of the present invention to provide a method of automatically backflushing a filter in a filtered flowpath on a scheduled basis.

Still other objects, features, and advantages of the present invention will become evident to those of ordinary skill in the art in light of the following.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 illustrates a method of cleansing a filter cartridge.

Figure 2 illustrates a method of cleansing a filter cartridge using a pressurized flow.

Figure 3 illustrates a primary flowpath according to the preferred embodiment.

Figure 4 illustrates a secondary flowpath for a filter backflush unit according to the preferred embodiment.

Figure 5 is a method flowchart for using the filter backflush unit according to the preferred embodiment.

Figure 6 illustrates a self-flushing filter backflush unit according to the preferred embodiment.

Figure 7 provides a method flowchart for using the self-flushing backflush unit according to the preferred embodiment.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

As required, detailed embodiments of the present invention are disclosed herein; however, it is to be understood that the disclosed embodiments are merely exemplary of the

invention, which may be embodied in various forms. It is further to be understood that the figures are not necessarily to scale, and some features may be exaggerated to show details of particular components or steps.

The invention at hand is a method and apparatus for backflushing a filtration device with purified water. Purified water includes water having a lower total dissolved solids reading than the water being filtered, preferably with a total dissolved solids reading fifty percent lower than that of the water being filtered, more preferably with a total dissolved solids reading eighty percent lower than that of the water being filtered, and still more preferably with a total dissolved solids reading ninety five percent lower than that of the water being filtered. Those skilled in the art will recognize that purified water may be produced using any suitable purification process, such as reverse osmosis, steam distillation or deionization. Backflushing of a filtration device allows the backflush media to lift compacted particles. Water with a low total dissolved solids reading is essentially unsaturated and able to dissolve particles attached to the filter medium. The particles are then removed from the filter medium through the use of a second flowpath terminating in a sanitary drain or other disposal. Various embodiments of the invention may be employed to extend the life of filters, unclog clogged filters or keep new filters from clogging. Backflushing of a filter may be accomplished manually or through an embodiment of this invention that automatically backflushes a filter on a scheduled basis.

In the simplest form, a filter 101 or a filter cartridge 118 may be removed from a filtered flowpath for cleansing with purified water. Cleansing may take place in various embodiments ranging from submerging the filter cartridge 118 in a container or sink to backflushing the filter cartridge 118 with a hose or a pressure flow system as shown in Figures 1 and 2, or a combination of both. Submerging the filter cartridge 118 in purified water dissolves the filtered

components clinging to a filter medium 130. In the pressurized flow system, purified water is forced backwards and forwards through the filter cartridge 118, therein dissolving and dislodging particles from the filter medium 130. The pressurized flow further allows the dissolved particles to be transported away from the filter medium 130, therein removing the high concentration of particles from the filtered flowpath.

Alternatively, the filter medium 130 may be cleansed in place with a backflush unit 100. The backflush unit 100 includes a primary flowpath 150 and a secondary flowpath 160. As shown in Figure 3, the primary or filtered flowpath 150 includes a filter 101, a fluid source 106, an inlet pipe 110, an outlet pipe 111 and an end-use device 107. The filter 101 includes the filter medium 130 disposed therein, an inlet end 114 and an outlet end 115, wherein fluids are filtered as they pass through the filter 101 from the inlet end 114, through the filter medium 130 in the filter cartridge 118 to the outlet end 115. The inlet end 114 of the filter 101 is coupled to the inlet pipe 110, which is coupled to the fluid source 106. The outlet end 115 is coupled to an outlet pipe 111, which in turn is coupled to the end-use device 107. Therein, water moves from the fluid source 106 through inlet pipe 110, through the filter 101, and through outlet pipe 111 to the end-use device 107 in the primary flowpath 150 for consumption or use.

The secondary flowpath 160 may be created from the primary flowpath 150 with the addition of a first tee 128 in the inlet pipe 110 between the inlet valve 102 and the inlet end 114 of the filter 101, a second tee 129 in the outlet pipe 111 near the outlet end 115 of the filter 101 and an inlet valve 102 between the first tee 128 and the fluid source 106 as shown in Figure 4. A first port 131 and a second port 132 of the first tee 128, therein connect to an inlet pipe 110a or 110b, respectively, while a third port 133 of the first tee 128 connects to a first port 141 of a drain valve 104. A second port 142 of the drain valve 104 connects to an inlet end 144 of a drain

pipe 113. An outlet end 145 of the drain pipe 113 is connected to a suitable sanitary disposal or storage device.

The second tee 129 includes a first port 146, a second port 147 and a third port 148. The first port 146 and the second port 147 connect to an outlet pipe 111a or 111b, respectively, and the third port 148 connects to a first port 152 of a flush valve 103. The flush valve 103 further includes a second port 153 connectable to a first end 121 of a flush inlet pipe 112. A second end 122 of the flush inlet pipe 112 is attached to a flush source 108.

The inlet valve 102 includes a first port 135 and a second port 136. The first port 135 is coupled to an inlet pipe 110c, which is attached to the fluid source 106. The second port 136 of the inlet valve 102 is connected to the inlet pipe 110b which further connects to the first port 131 of the first tee 128. Having an on and an off position, the inlet valve 102 provides the ability to stop the flow of fluid from the fluid source 106.

The secondary flowpath 160, used for backflushing and cleansing the filter medium 130 in the filter 101, does not impact the primary flowpath 150 when the inlet valve 102 is in an open position, and the flush valve 103 and the drain valve 104 are in a closed position. In a backflushing or cleansing mode, the inlet valve 102 is in a closed position, and the flush valve 103 and the drain valve 104 are in an open position. Therein, the secondary flowpath 160 allows purified water to flow from the flush source 108 through the flush inlet pipe 112, through the flush valve 103 and into the second tee 129 to gain entrance to the primary flowpath 150. The secondary flowpath 160 continues from the second tee 129, through the outlet pipe 111a, in the outlet end 115 of the filter 101, backwards through the filter medium 130, out the inlet end 114 of the filter 101, through the inlet pipe 110a, through the first tee 128, through the first port 141 of the drain valve 104, through the drain valve 104 and the drain pipe 113 to a suitable disposal.

Switching of the positions of the inlet valve 102, the flush valve 103 and the drain valve 104, substantially simultaneously, therein provides either the primary flowpath 150 or the secondary flowpath 160 for use.

The flush media stored in the flush source 108 in this preferred embodiment is purified water. While this embodiment has been shown to include a flush source 108, it should be clearly evident to one skilled in the art that the flush source 108 containing flush media could be permanently installed or temporarily installed at the flush inlet pipe 112. Still another embodiment could include pouring flush media into the flush inlet pipe 112 as required for cleaning or cleansing of the filter cartridge 118 in the filter 101.

In operation, the backflush unit 100 must be changed from a non-flush state to a flush mode to execute a backflush routine. The process of going from the non-flush state to the flush mode is shown in the method flowchart of Figure 5. The process commences with step 10, wherein the inlet valve 102 is closed to shut off the flow of fluid from the fluid source 106, and the flush valve 103 and the drain valve 104 are opened to utilize the secondary flowpath 160. As shown in step 20, the process continues with purified water flowing from the flush source 108, through the flush source pipe 112, through the flush valve 103 and into the second tee 129, therein gaining entrance to the primary or filtered flowpath 150. The purified water then flows through the first port 146 of the second tee 129, through the outlet pipe 111a, into the outlet end 115 of the filter 101, backwards through the filter 101, out the inlet end 114, through the source inlet pipe 110a, through the second port of the first tee 128, through the third port of the first tee 128, through the drain valve 104 and through the outlet pipe 113 for disposal. Upon completion of a prescribed backflushing time, one to two minutes in this preferred embodiment, the process moves to step 30, wherein the inlet valve 102, the flush valve 103 and the drain valve 104 are

switched back to the primary or filtered flowpath 150 to stop the backflushing operation and allow fluid to again flow from the fluid source 106 to the end-use device 107. Switching of the valves in steps 10 and 30 may be accomplished manually.

The flowing of purified water backwards through the filter 101 dissolves, unclogs and removes particles embedded in the filter medium 130. The removal of particles and calcified filtered debris from the filter medium 130 increases the efficiency and life span of the filter 101. Execution of a backflush routine on a regularly scheduled basis unclogs clogged portions of the filter medium 130 and ensures the filter medium 130 will not become clogged.

In another embodiment, a backflush unit 200 is identical to the aforementioned backflush unit 100 shown in Figure 4, however, the addition of components allows the backflush unit 200 to execute a backflush routine on a prescribed interval. As such, similar components are marked with like numerals. As shown in Figure 6, the backflush unit 200 further includes a controller 220, a plurality of electrically actuated valves 202, 203 and 204, a wire harness 221, 222 and 223 for each respective valve, and a power source (not shown). Hydraulically, the backflush unit 200 operates identically to the backflush unit 100, with water flowing from the source 106 to the end-use device 107 under normal operation in the primary flowpath 150. In the backflush mode, the secondary flowpath 160 allows flush media to move from the flush source 108, through the flush valve 203, through the outlet pipe 111a, backwards through the filter 101, through the inlet pipe 110a, through the drain valve 204 and through the drain pipe 113 to a proper disposal.

The method steps for using the backflush unit 200 are show in Figure 7. The process commences with a start command as shown in step 40. In step 45, the controller 220 is in a wait state. The process then moves to step 50, wherein the controller 220 checks for timer activation. If the timer has not been activated in step 50, the controller 220 returns to step 45. If the timer

has been activated in step 50, the controller 220 moves to step 60, wherein the controller 220 sends signals to switch the flowpaths, wherein the inlet valve 202 is closed, and the flush valve 203 and the drain valve 204 are opened to move the system flow from the primary flowpath 150 to the secondary flowpath 160.

After changing to the secondary flowpath 160, purified water flows from the flush source 108, through the flush source pipe 112, through the flush valve 203, through the outlet pipe 111a, backwards through the filter 101, through the inlet pipe 110a, through the drain valve 204, and through the drain pipe 113 to a proper disposal as shown in step 65. After the flush has been activated for a predetermined interval, one to two minutes in this preferred embodiment, the controller 220 moves to step 70, wherein the controller 220 switches the system to the primary flowpath 150 to allow water to flow from the water source 106 to the end-use device 107. The process then moves to step 75, wherein the controller 220 checks for a stop signal. If a stop signal has not been noted, the process returns to step 45, wherein the controller 220 waits for activation of the timer. The controller 220 will continue to activate and deactivate the flush mode on a predetermined interval, approximately every six hours in this preferred embodiment. If a stop signal has been noted, the process will move to step 80, where it will end.

Controller 220, in this preferred embodiment includes a microcontroller, associated hardware and software, timer mechanisms, and the like. Further extensions of this embodiment include programmable software routines for customization of backflushing subroutines in a water treatment system. While this invention has been shown with three valves, it should be clearly evident to one skilled in the art that the number of valves and flow lines may be adjusted to accommodate various types of water systems and components. Power requirements for this invention may include the unit operating with an integral power source, a separate power source

or the backflush unit 100 may be slaved off of an existing power supply in an associated water treatment system component.

Although the present invention has been described in terms of the foregoing preferred embodiment, such description has been for exemplary purposes only and, as will be apparent to those of ordinary skill in the art, many alternatives, equivalents, and variations of varying degrees will fall within the scope of the present invention. That scope, accordingly, is not to be limited in any respect by the foregoing detailed description; rather, it is defined only by the claims that follow.

CLAIMS

I claim:

1. A method of cleansing a filter, comprising;

   providing a source of purified water; and

   exposing the filter to the purified water.

2. The method of claim 1, wherein the filter includes a filter cartridge.

3. The method of claim 1, wherein the purified water includes water treated by a reverse osmosis, a steam distillation or a deionization process.

4. The method of claim 1, wherein the purified water includes water having a lower total dissolved solids reading than water being filtered.

5. The method of claim 1, wherein the purified water has a total dissolved solids reading at least fifty percent less than water being filtered.

6. The method of claim 1, wherein the purified water has a total dissolved solids reading at least eighty percent less than water being filtered.

7. The method of claim 1, wherein the purified water has a total dissolved solids reading at least ninety five percent less than water being filtered.

8. The method of claim 1, further comprising;

   backflushing the filter with the purified water.

9. An apparatus for cleansing a filter, comprising:

   a source of purified water; and

   a container for the purified water to expose a filter to the purified water.

10. The apparatus of claim 9, wherein the container includes a tank for submersing the filter.

11. The apparatus of claim 9, wherein the container includes a pressurized source of purified water to cleanse the filter.

12. The apparatus of claim 11, wherein the container includes a pressurized source of purified water to backflush the filter.

13. The apparatus of claim 9, wherein the purified water includes water treated by a reverse osmosis, a steam distillation or a deionization process.

14. The apparatus of claim 9, wherein the purified water includes water having a lower total dissolved solids reading than water being filtered.

15. The apparatus of claim 9, wherein the purified water has a total dissolved solids reading at least fifty percent less than water being filtered.

16. The apparatus of claim 9, wherein the purified water has a total dissolved solids reading at least eighty percent less than water being filtered.

17. The apparatus of claim 9, wherein the purified water has a total dissolved solids reading at least ninety five percent less than water being filtered.

18. A filter backflush unit, comprising:

a filter, having an inlet end and an outlet end in a filtered flowpath;

a flush valve having an open and a closed position, coupled to the filtered flowpath after the outlet end;

a drain valve having an open and a closed position, coupled to the filtered flowpath before the inlet end;

an inlet valve having an open and a closed position in the filtered flowpath prior to the drain valve; and

a flush source containing water purified through a reverse osmosis, steam distillation or deionization process, wherein the flush source is coupled to the flush valve to allow a flow of the purified water to pass through the flush valve, into the outlet end of the filter, and backwards through the filter, therein exiting through the drain valve when the inlet valve is in a closed position and the flush valve and drain valve are in an open position.

19. The filter backflush unit recited in claim 18, wherein the flush valve, the inlet valve and the drain valve each comprise a solenoid operated flow control valve.

20. The filter backflush unit recited in claim 19, further comprising a controller adapted to control said inlet valve, said flush valve and said drain valve.

21. The filter backflush unit as recited in claim 20, wherein said controller comprises a microcontroller.

22. The filter backflush unit as recited in claim 21, wherein said controller is adapted to periodically operate said valves to execute a backflush routine.

23. A filter backflush unit, comprising:

a filter, having an inlet end and an outlet end in a filtered flowpath;

a flush valve having an open and a closed position, coupled to the filtered flowpath after the outlet end;

a drain valve having an open and a closed position, coupled to the filtered flowpath before the inlet end;

an inlet valve having an open and a closed position in the filtered flowpath prior to the drain valve; and

a flush source containing purified water having a total dissolved solids reading less than that of the water normally being filtered in the filtered flowpath, wherein the flush source is coupled to the flush valve to allow a flow of the purified water to pass through the flush valve, into the outlet end of the filter, and backwards through the filter, therein exiting through the drain valve when the inlet valve is in a closed position and the flush valve and drain valve are in an open position.

24. The filter backflush unit of claim 23, wherein the water used in the backflushing has a total dissolved solids reading at least fifty percent less than the total dissolved solids reading of the water being filtered in normal dispensing operations.

25. The filter backflush unit of claim 23, wherein the water used in the backflushing has a total dissolved solids reading at least eighty percent less than the total dissolved solids reading of the water being filtered in normal dispensing operations.

26. The filter backflush unit of claim 23, wherein the water used in the backflushing has a total dissolved solids reading at least ninety five percent less than the total dissolved solids reading of the water being filtered in normal dispensing operations.

27. The filter backflush unit recited in claim 23, wherein the flush valve, the inlet valve and the drain valve each comprise a solenoid operated flow control valve.

28. The filter backflush unit recited in claim 27, further comprising a controller adapted to control said inlet valve, said flush valve and said drain valve.

29. The filter backflush unit as recited in claim 28, wherein said controller comprises a microcontroller.

30. The filter backflush unit as recited in claim 28, wherein said controller is adapted to periodically operate said valves to execute a backflush routine.

31. A filter backflush unit comprising,

a primary flowpath; wherein the primary flowpath is used for normal dispensing operations; and

a secondary flowpath, wherein the filter backflush unit switches from the primary flowpath to the secondary flowpath to execute filter backflushing routines with a flow of water purified using a reverse osmosis, steam distillation or deionization process.

32. A filter backflush unit comprising,

a primary flowpath; wherein the primary flowpath is used for normal dispensing operations; and

a secondary flowpath, wherein the filter backflush unit switches from the primary flowpath to the secondary flowpath to execute filter backflushing routines with a flow of water having a total dissolved solids reading less than the total dissolved solids reading of the water being filtered in normal dispensing operations.

33. The filter backflush unit of claim 32, wherein the water used in the backflushing has a total dissolved solids reading at least fifty percent less than the total dissolved solids reading of the water being filtered in normal dispensing operations.

34. The filter backflush unit of claim 32, wherein the water used in the backflushing has a total dissolved solids reading at least eighty percent less than the total dissolved solids reading of the water being filtered in normal dispensing operations.

35. The filter backflush unit of claim 32, wherein the water used in the backflushing has a total dissolved solids reading at least ninety five percent less than the total dissolved solids reading of the water being filtered in normal dispensing operations.

36. A method for backflushing a filter, comprising;

a. switching an inlet valve, a drain valve and a flush valve in a filtered flowpath from a primary flowpath used for dispensing operations to a secondary flowpath, therein allowing purified water into the filtered flowpath;

b. flowing the purified water in the secondary flowpath, wherein the secondary flowpath allows the purified water to flow backwards through the filter for a predetermined interval to remove or dissolve filtered media or unclog a filter in the primary flowpath; and

c. switching the inlet valve, the drain valve and the flush valve from the secondary flowpath to the primary flowpath to resume dispensing operations.

37. The method for backflushing a filter as recited in claim 36, further comprising;

d. Repeating steps a.–c. to provide a continued cleansing of the filter medium.

38. The method of claim 36, wherein the purified water includes water treated by a reverse osmosis, a steam distillation or a deionization process.

39. The method of claim 36, wherein the purified water includes water having a lower total dissolved solids reading than water being filtered.

40. The method of claim 36, wherein the purified water has a total dissolved solids reading at least fifty percent less than water being filtered.

41. The method of claim 36, wherein the purified water has a total dissolved solids reading at least eighty percent less than water being filtered.

42. The method of claim 36, wherein the purified water has a total dissolved solids reading at least ninety five percent less than water being filtered.

ABSTRACT

A method and corresponding apparatus employ purified water to backflush a filtration device. Purified water includes water having a total dissolved solids reading less than that of the water being filtered. Examples of purified water may include water treated using reverse osmosis, steam distillation, or deionization processes, and the like. In the simplest form, the purified water is used to rinse or backflush a filter or filter cartridge. Further extensions include valves to switch from a primary flowpath used for normal operations to a secondary flowpath used to conduct backflushing routines. Backflushing routines may be initiated on demand or through an automated routine that repeats the process on a regular basis.

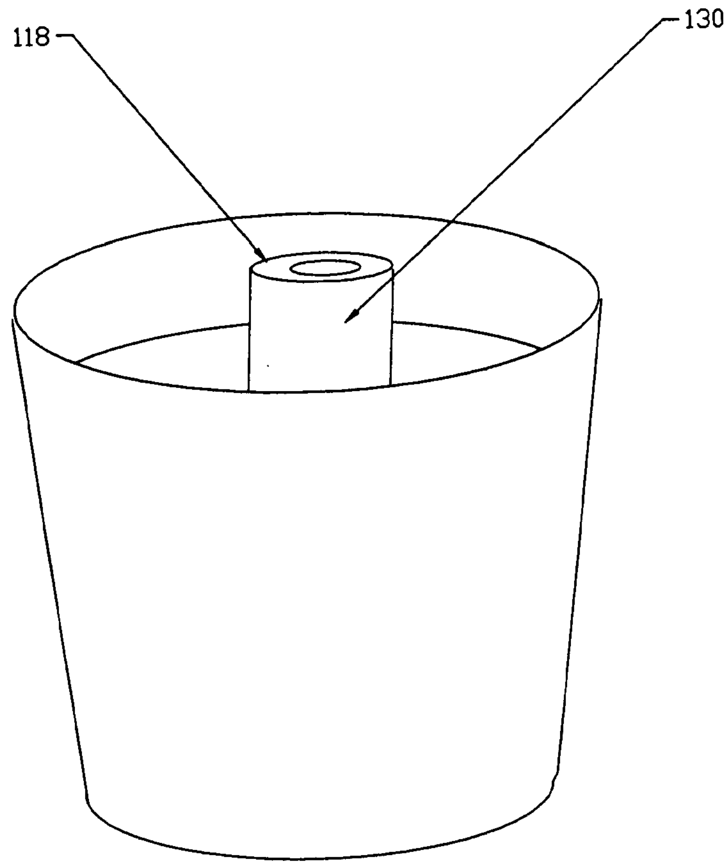


FIGURE 1

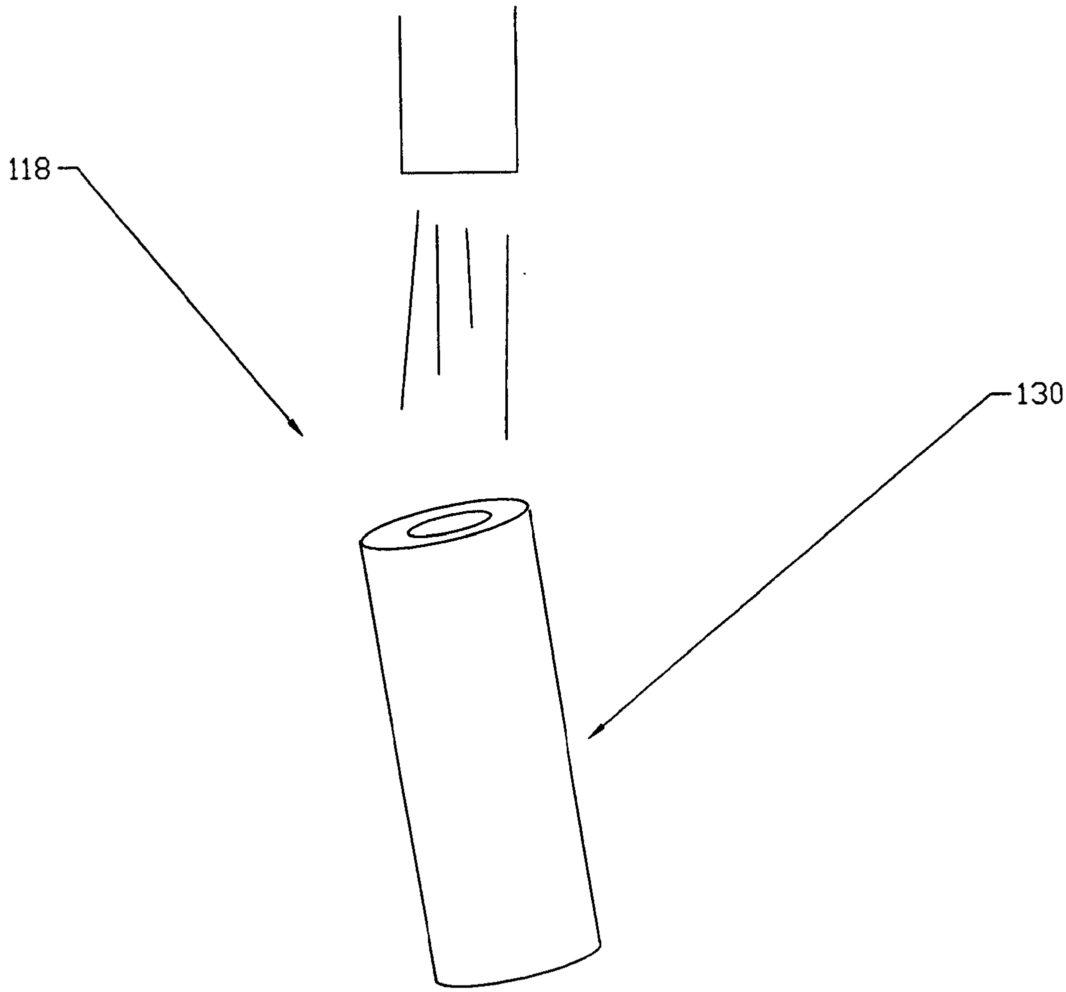


FIGURE 2

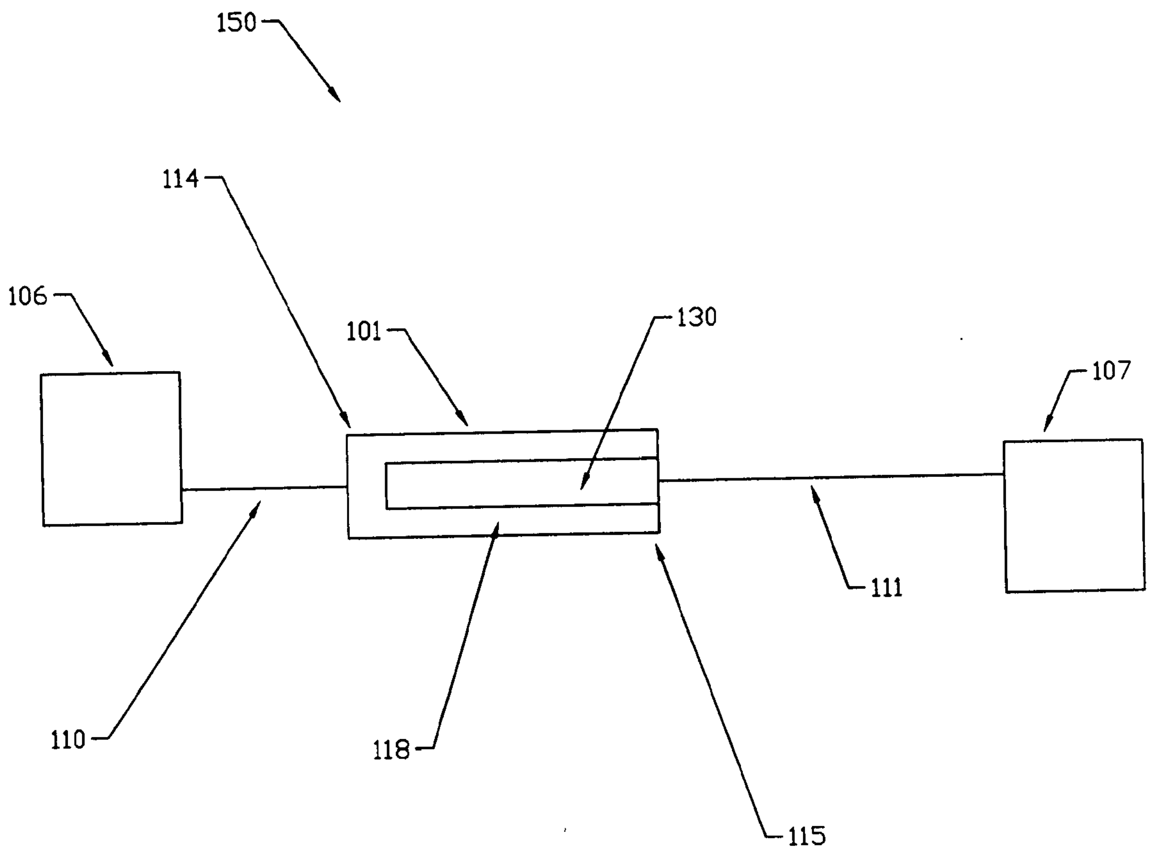
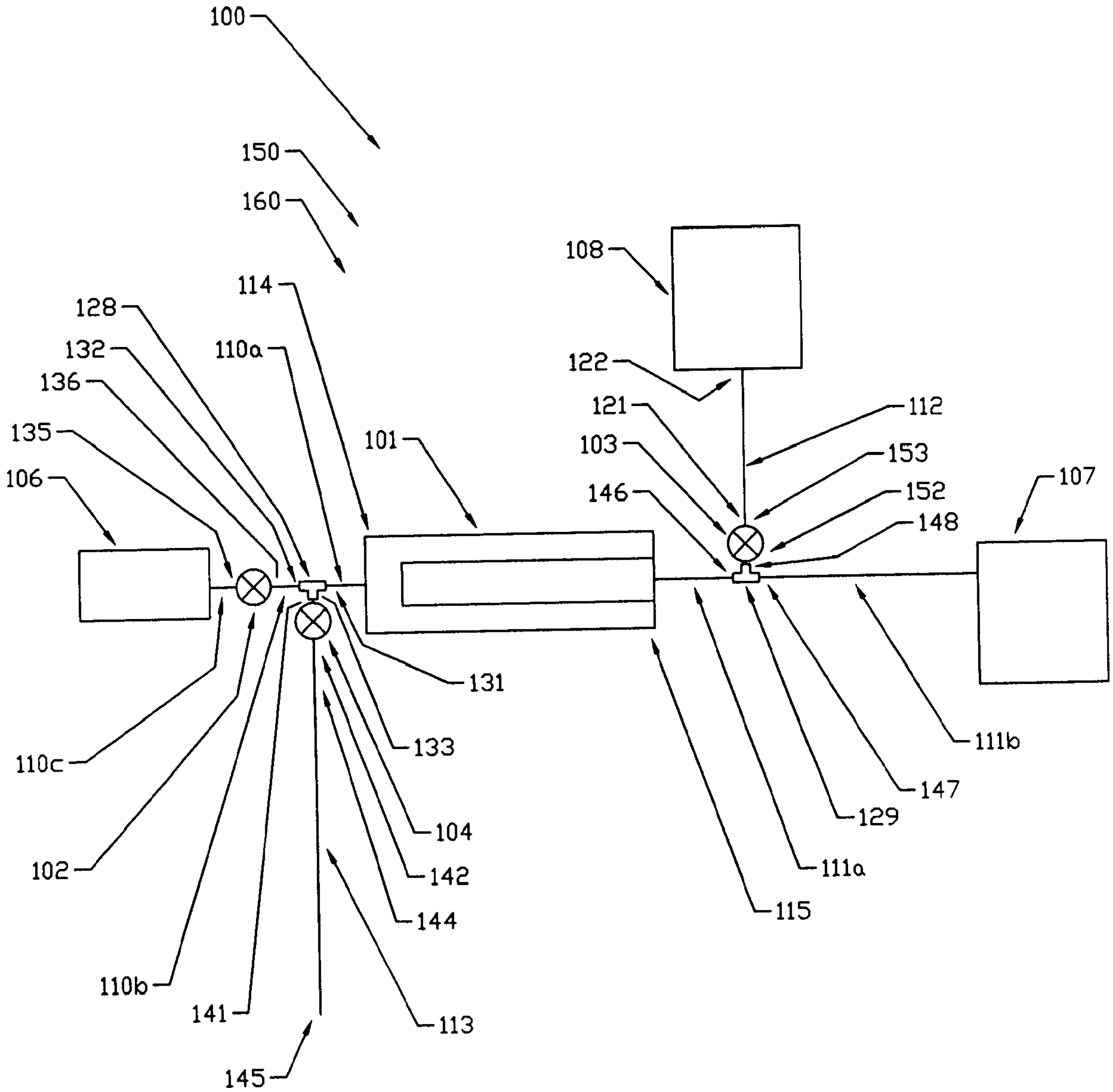


FIGURE 3



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129
111a
115

FIGURE 4

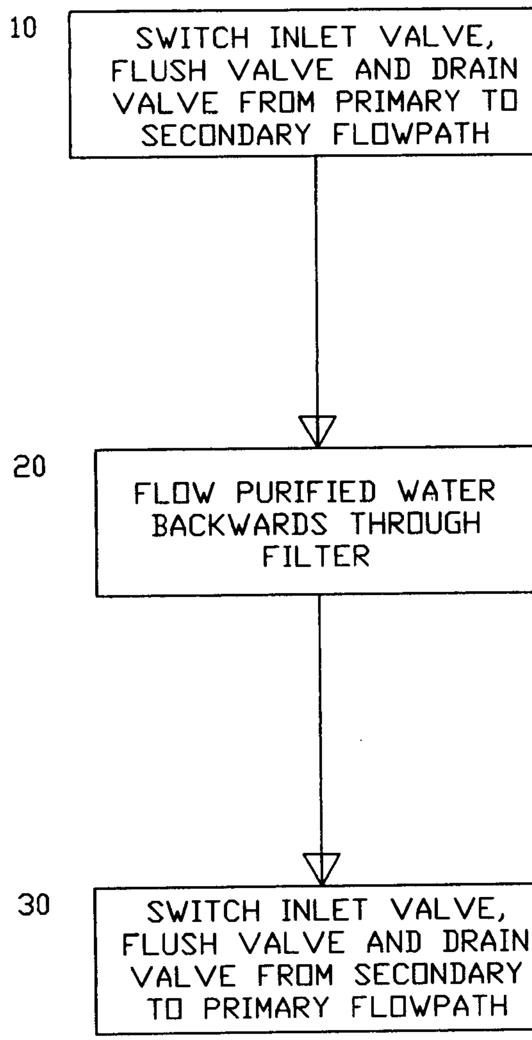
10
SWITCH INLET VALVE, FLUSH VALVE AND DRAIN VALVE FROM PRIMARY TO SECONDARY FLOWPATH
20
FLOW PURIFIED WATER BACKWARDS THROUGH FILTER
30
SWITCH INLET VALVE, FLUSH VALVE AND DRAIN VALVE FROM SECONDARY TO PRIMARY FLOWPATH

Figure 5

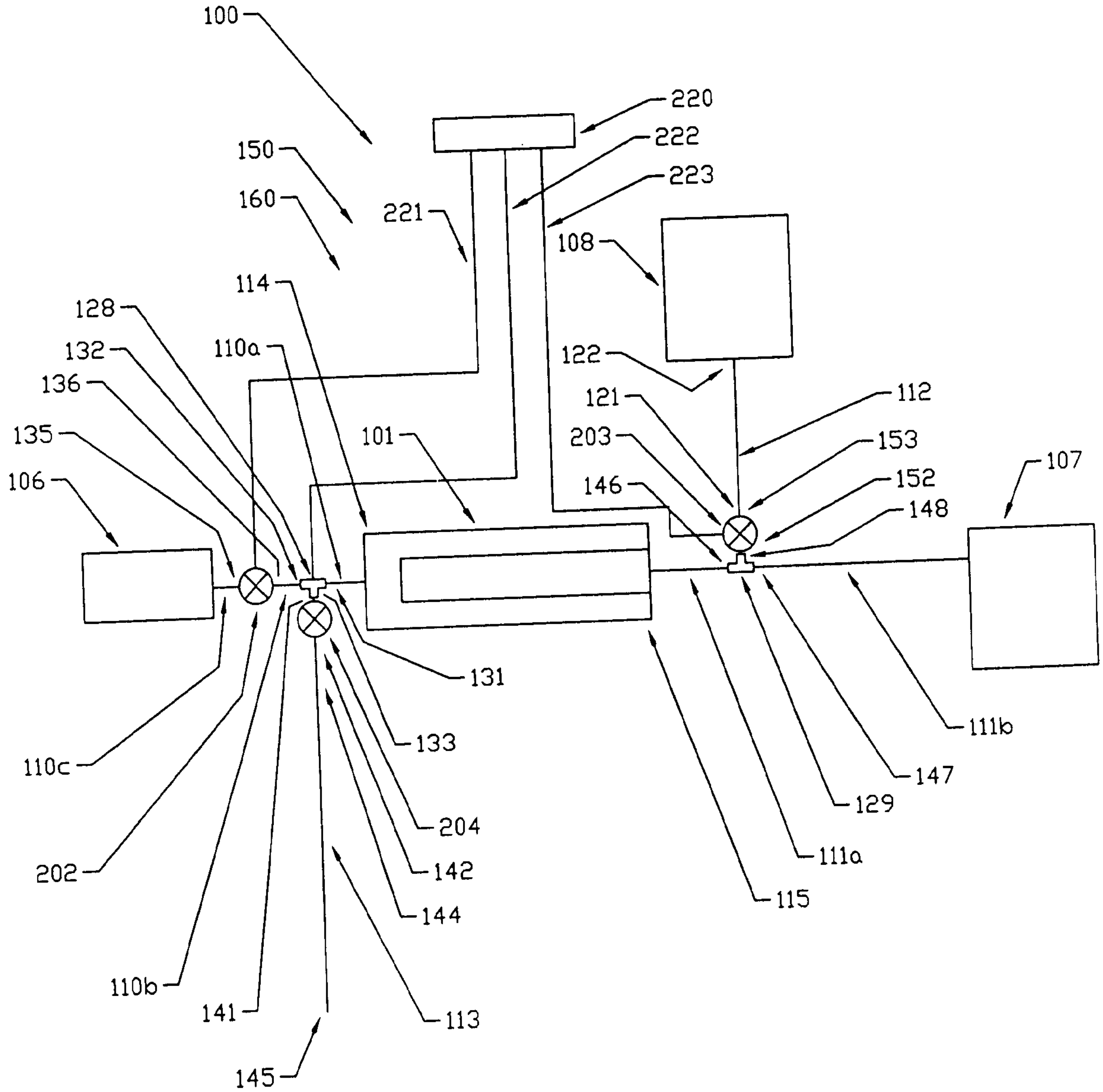
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FIGURE 6

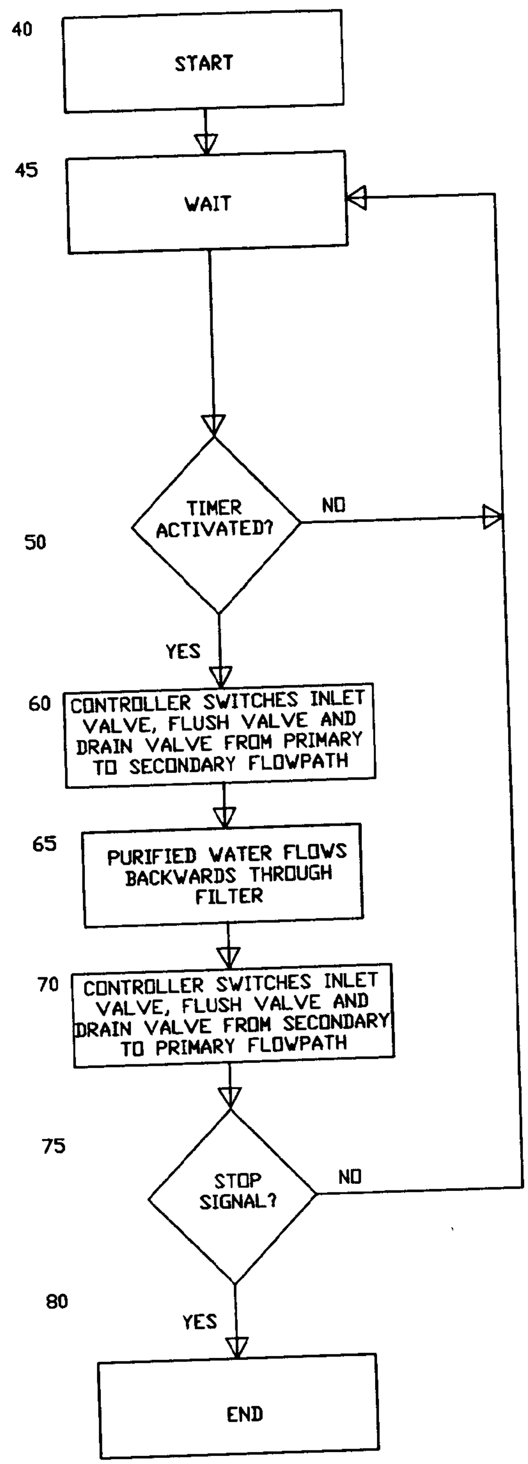
40
START
45
WAIT
TIMER ACTIVATED?
NO
50
YES
60
CONTROLLER SWITCHES INLET VALVE, FLUSH VALVE AND DRAIN VALVE FROM PRIMARY TO SECONDARY FLOWPATH
65
PURIFIED WATER FLOWS BACKWARDS THROUGH FILTER
70
CONTROLLER SWITCHES INLET VALVE, FLUSH VALVE AND DRAIN VALVE FROM SECONDARY TO PRIMARY FLOWPATH
75
STOP SIGNAL?
NO
80
YES
END

Figure 7

US006562246B2

(12) United States Patent
McGowan

(10) Patent No.: US 6,562,246 B2
(45) Date of Patent: May 13, 2003

(54) **PRESSURIZED BACKFLUSH SYSTEM**

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(73) Assignee: **Kadant Inc.**, Acton, MA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **09/943,716**

(22) Filed: **Aug. 31, 2001**

(65) **Prior Publication Data**

US 2003/0042184 A1 Mar. 6, 2003

(51) **Int. Cl.**7 .... **B01D 37/00**

(52) **U.S. Cl.** **210/791**; 210/108; 210/141; 210/411; 210/412; 55/302

(58) **Field of Search** 210/87, 90, 108, 210/141, 143, 321.69, 333.01, 411, 412, 418, 420, 422, 427, 636, 791, 798; 95/278–280; 55/302

(56) **References Cited**

U.S. PATENT DOCUMENTS

5,032,287 A		7/1991	Salmond	210/427
5,047,154 A	*	9/1991	Comstock et al.	210/321.69
5,128,107 A	*	7/1992	Katoh et al.	210/411
5,234,605 A	*	8/1993	Reipur et al.	210/333.01
5,374,351 A		12/1994	Bolton et al.	210/411
5,512,167 A	*	4/1996	Gramms et al.	210/412
5,769,539 A	*	6/1998	Tsang et al.	210/636
5,846,420 A		12/1998	Bolton et al.	210/412

FOREIGN PATENT DOCUMENTS

DE	198 10 518 A	9/1999
FR	2 586 202 A	2/1987

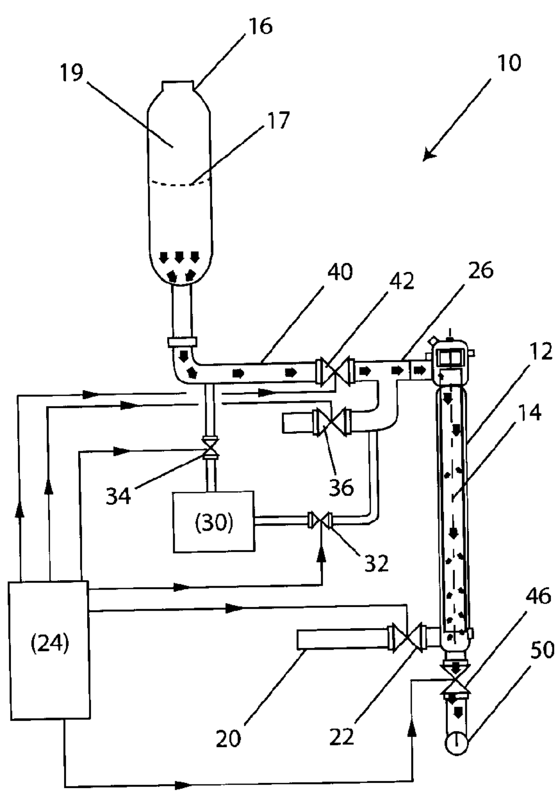
* cited by examiner

Primary Examiner—Joseph W. Drodge
(74) *Attorney, Agent, or Firm*—Frommer Lawrence & Haug LLP; Ronald R. Santucci

(57) **ABSTRACT**

A filter backflushing system including an accumulator containing a pressurized bladder which propels a supply of backwash fluid contained within the accumulator in a reverse direction through a filter element. While the backwash fluid is pumped within the accumulator, an inert gas inside the bladder is compressed against the inside walls of the accumulator. Upon reaching a pressure of approximately 300–600 psi, the filtered fluid is released from the accumulator and the full energy of the compressed gas is released as well. This release produces a high pressure rapid burst of backwash fluid which effectively removes clogging contaminants from a filter element.

11 Claims, 3 Drawing Sheets



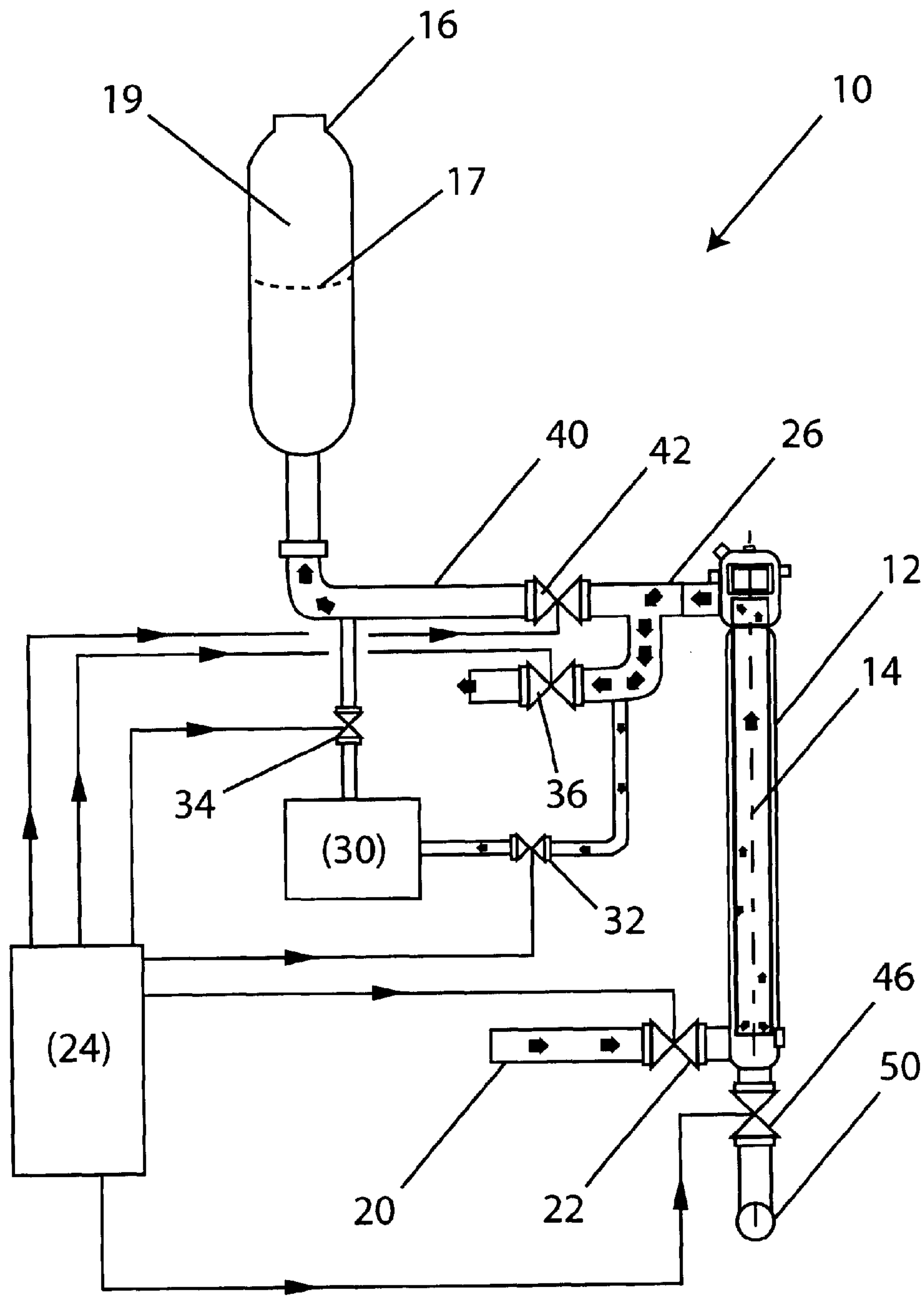


FIG. 1

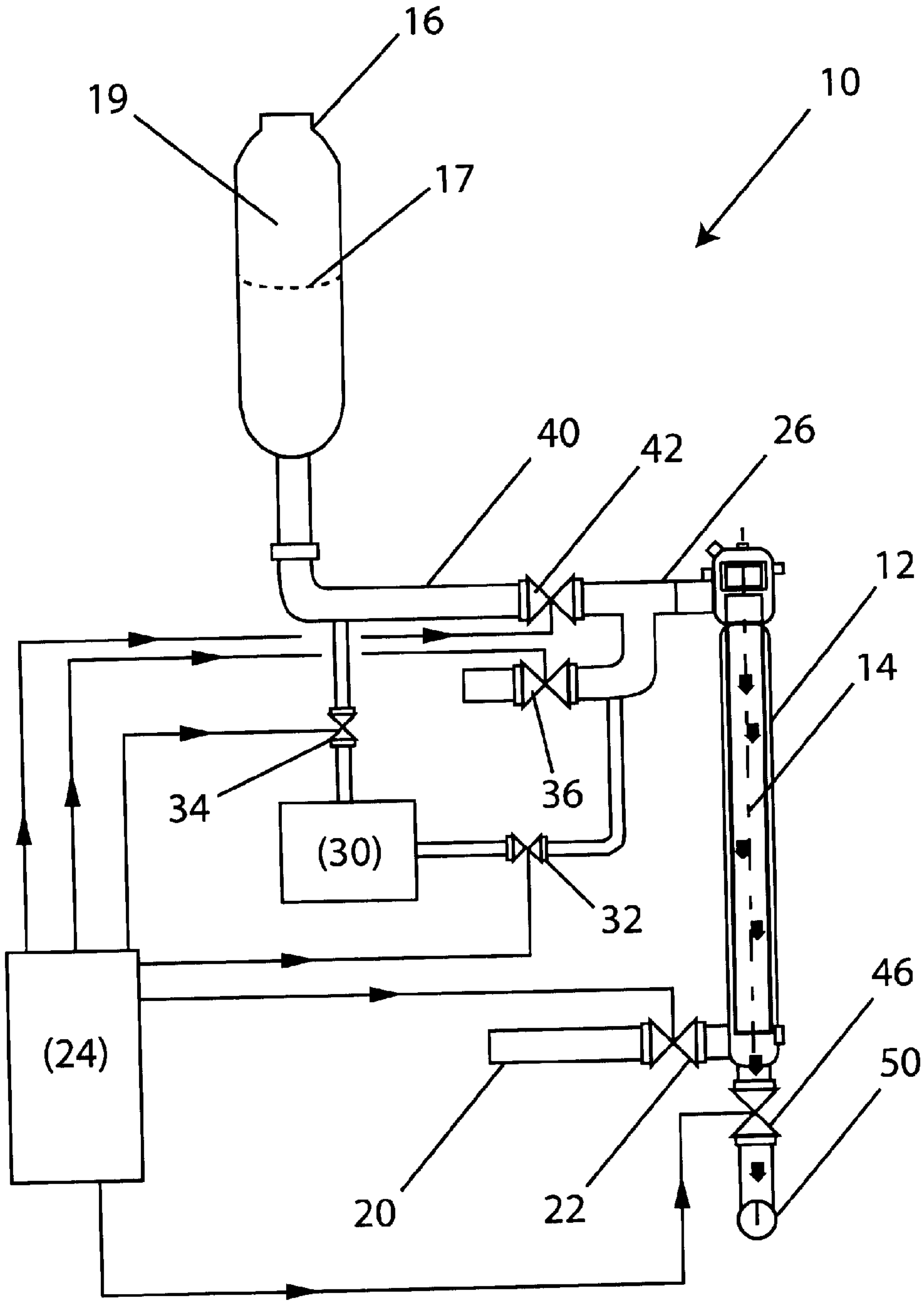


FIG. 2

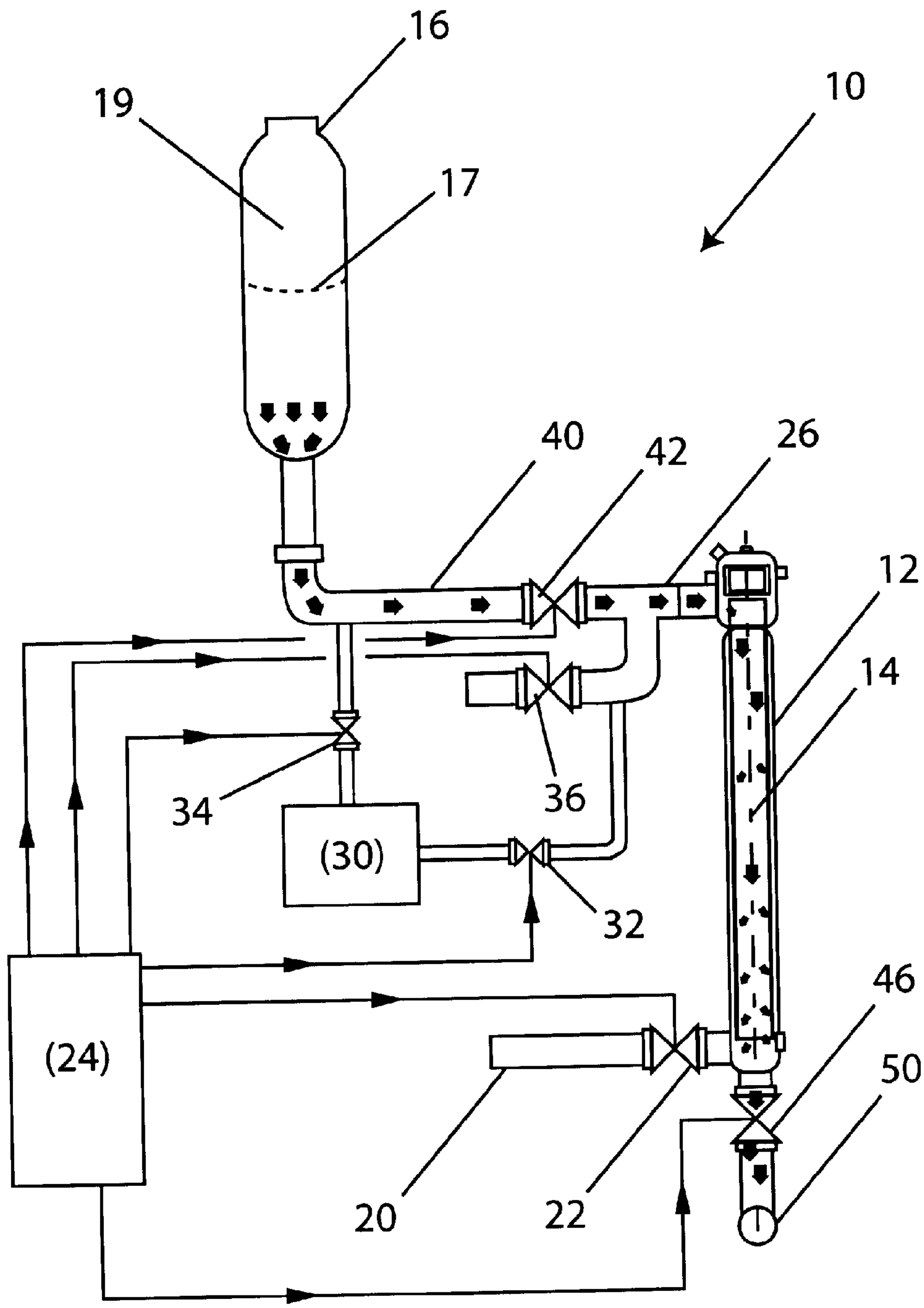


FIG. 3

PRESSURIZED BACKFLUSH SYSTEM

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a filtering system and, more particularly, to a filter backflushing system for removing contaminants from a filter element, the backflushing system includes a bladdered accumulator for providing a high pressure rapid burst of backflush fluid stored within the accumulator in a reverse flow through the filter element.

2. Brief Description of the Prior Art

A filtered supply of a coolant, lubricant, fuel, water or other fluid is oftentimes essential for the proper operation and maintenance of a multitude of industrial automotive and commercial systems. Unfortunately, the filter elements utilized to filter such fluids must be periodically replaced or cleansed to remove a clogging accumulation of contaminants and foreign matter therefrom.

The periodic removal and replacement of a clogged filter element generally requires the shutting down of an associated system during the replacement procedure. The expensive, nonproductive downtime of the filtration and associated systems, the replacement cost of the filter element and the expenses incurred to properly dispose of the soiled filter element and the contents thereof in accordance with the ever increasing degree of governmental and environmental mandates, have led to the development of numerous integrated filter element cleansing systems.

One type of integrated system, generally termed backflushing or backwashing, generates a reverse flow of fluid through individual filter elements to dislodge the contaminants therefrom, wherein the backflushing fluid has been filtered by a singular filter or multiple filters. Advantageously, backflushing reduces the operational cost of filtering and associated systems by extending the usable life of the filter elements, by reducing the systems' downtime required to replace filter elements and by reducing disposal costs.

In U.S. Pat. No. 5,374,351, a filter backflushing system is provided. The filtration system includes either a pneumatically-driven piston or pneumatic accumulator for propelling a high pressure backflush fluid through the system in a reverse direction. This reverse backflush flow then removes contaminants from a filter element. An external pneumatic system provides replenishing air pressure to the piston or accumulator, allowing its continued operation. Air replenishment is needed in non-pistoned accumulators because in the accumulator pressurized air becomes entrained with the backflushing fluid and this pressurized air is lost during the backflushing operation. In a pistoned accumulator, replenishment is needed to repressurize the piston chamber and replace any air which blows by the piston area, thus becoming entrained in the backflushing fluid. Similarly, in U.S. Pat. No. 5,846,420, an external pneumatic system provides replenishment air pressure to a piston arrangement, allowing a pressurized backflushing operation. While such systems work very satisfactorily, there is always a desire to improve upon their operation.

In this regard there is a desire to eliminate the requirement for a separate air replenishment system supporting the backflushing operation. Also, there is a desire to eliminate the possibility of entrained air in the backwash fluid. By doing so, the backwashed filters will not be exposed to a fluid composition not normally used in regular operations.

SUMMARY OF THE INVENTION

An object of the present invention is to provide a filter backflushing system having a bladder-type accumulator which supplies a short duration, high intensity backflushing flow through a filter element.

A further object of the present invention is to provide a filter backflushing system which supplies a regulated backflushing flow through a filter element.

A still further object of the present invention is to provide a filter backflushing system which is highly suited for effectively and efficiently removing contaminants in virtually any type of filtration system.

A still further object of the present invention is to provide a self-contained filter backflushing system independent of an air or pressurized replenishment system.

A still further object of the present invention is to provide a filter backflushing system which uses filtered fluid in a backflushing operation.

A still further object of the present invention is to provide a filter backflushing system which can also use a specialized backflush material for specific applications.

To attain these objectives, there is provided a filter backflushing system which includes a filter housing enclosing a removable filter element, a valve controlled feed pipe for introducing an unfiltered fluid into the filter housing, a valve controlled output feed pipe for removing filtered fluid from the filter housing, a backflushing fluid accumulator enclosing a bladder which stores a portion of the filtered fluid, an accumulator charging pump for providing pressurized filtered fluid from a portion of the outlet feed pipe to the accumulator, and an actuator responsive to system fluid pressure.

The bladder of the accumulator containing backflushing liquid is effectively isolated by a membrane which contains a compressible inert gas in the remaining volume of the backflush fluid accumulator. Preferably, the minimum bladder volume of the backflushing fluid accumulator is substantially equivalent to the filter housing volume, thus allowing the clean, filtered fluid contained within the backflushing fluid accumulator to completely displace the fluid within the filter housing during the backflushing operation. A complete displacement would substantially remove all of the flow reducing contaminants and foreign matter which have clogged the filter element.

In response to an actuating signal, the bladder can rapidly de-compress within the interior of the backflushing fluid accumulator. This rapid de-compression, assisted by the compressed inert gas between the membrane of the bladder and the interior accumulator wall, propels the filtered fluid contained within the accumulator in a reverse direction through the filtering system. The compression force of the bladder produces a high, constant fluid pressure within the filter backflushing system which effectively backflushes the filter element. The backflushing flow may be regulated in accordance with the requirements of the filter, the types of fluids flowing through the filtration system or other parameters. In particular, the backflushing flow intensity may be regulated by altering the relative expansion capacity of the bladder, use of restrictive flow orifices in the backflush feed pipe varying the output pressure of the accumulator charging pump, or adjusting the actuation signal.

The direction of fluid flow through the filter backflushing system is controlled by a plurality of suitably positioned pneumatically controlled valves. In particular, the accumulator pump input and output feed pipes for isolating the

accumulator pump, the feed pipe for inputting the solid/fluid mixture into the interior of the filter element, the backwash feed pipe for supplying backwash fluid from the accumulator to the filter element, the outlet feed pipe for discharging filtered fluid from the filter element and the drain output for removing fluid from the filter housing, each include a valve which is adapted to selectively shut off or enable the flow of fluid therethrough during the normal filtering and backflushing operations of the filter backflushing system.

During normal filtration, a solid/fluid mixture enters the filter element through the input feed pipe, thereby allowing the solid and fluid mixture to be separated by the filter element. The filtered fluid enters the output feed pipe disposed proximate the top of the filter housing. The filtered fluid contained within the output feed flows on to systems supported by the filtration system. A small portion of the filtered fluid branches off the output feed and is further pressurized by the accumulator charging pump. The accumulator charging pump discharges the pressurized filtered fluid to the backflushing fluid accumulator compressing the bladder contained within.

During the backflushing operation, the direction of fluid flow is reversed in regard to the filtration mode. First, the accumulator charging pump input, the accumulator charging pump output, the output feed pipe, and feed pipe control valves are closed simultaneously or in rapid succession. The accumulator charging pump is deactivated immediately before or after the valve closure. Subsequently, the drain output control valve and backflush feed control valve are opened, allowing the backflushing fluid to flow from the bladder of the accumulator onto the filter housing in a purging action. Once the bladder reaches the end of its capacity or the pressure of the backflush feed decreases to a preset point, the drain output control valve and backflush feed control valve are closed. The output feed pipe, feed pipe accumulator charging pump input, and accumulator charging pump output control valves are then reopened. Upon activation of the accumulator charging pump the system is returned to a condition for a normal filtering operation.

BRIEF DESCRIPTION OF THE DRAWINGS

Thus by the present invention its objects and advantages will become readily apparent upon reading the following detailed description of the invention in conjunction with the accompanying drawings, in which:

FIG. **1** depicts a pressurized backflushing system in a filtration mode.

FIG. **2** depicts a pressurized backflushing system in a filter housing draining mode.

FIG. **3** depicts a pressurized backflushing system in a backflush mode.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now specifically to the drawings, wherein like reference numerals refer to like elements throughout the several views, one sees that FIG. **1** depicts a pressurized backflush system in a normal filtration mode.

As illustrated in FIG. **1**, the pressurized backflushing system **10** generally includes a filter housing **12** with a filter element **14** enclosed therein and a backflushing fluid accumulator **16** with a bladder **17** enclosed therein. Feed pipe **20** is provided for introducing a supply of solid/fluid mixture into the interior of filter element **14**. A pneumatically-controlled valve **22** is utilized to shut off or regulate the flow of the solid/fluid mixture through feed pipe **20**, in accordance with a signal provided by pneumatic control panel **24**. Pneumatically-controlled valve **22** and other pneumatically-controlled valves listed below are used in the pressurized backflush system described; however, other types of automatically operated valves known to those skilled in the art may be used.

After filtration in filter element **14**, the filtered fluid flows out of the top of the filter housing **12**, through an output feed pipe **26**. A small portion of the filtered fluid enters a pump input feed pipe **28** which supplies filtered fluid to accumulator charging pump **30**. Pneumatically-controlled valves **32**,**34** are utilized to shut off or regulate the flow of filtered fluid to accumulator charging pump **30** in accordance with a signal provided by pneumatic control panel **24**. Valve **36** is utilized to shut off or regulate the flow of filtered fluid to outside systems also in accordance with a signal provided by the pneumatic control panel **24**.

Accumulator charging pump **30** discharges pressurized filtered fluid to backflushing fluid accumulator **16**. Bladder **17** of backflushing accumulator **16** can preferably contain a volume of compressed gas substantially equal to the volume of fluid contained in filter housing **12**. Between the interior of accumulator housing **16** and the bladder **17**, a volume **19** of inert gas compresses as accumulator **16** stores pressurized filtered fluid. Membrane **17**, which is preferably made of rubberized material but may be made of any other material known to those skilled in the art, effectively isolates the backflushing fluid from volume **19**. This isolation prevents any air or inert gas from entering the backflushing system.

FIG. **2** depicts the pressurized backflushing system in a filter housing draining mode. The filter housing draining mode is an operation that can be performed prior to backflushing. The draining of filter housing **12** is not required prior to backflushing; however, the effectiveness of backflushing can be enhanced by pre-draining. In the figure, filter housing **12** is isolated from the feed and discharge systems by closing valves **22** and **36**. Immediately before or immediately after the closing of valves **22** and **36**, valves **34** and **42** are closed and accumulator charging pump **30** may be deactivated. Pneumatically controlled drain output valve **46** is then opened, allowing fluid contained in filter housing **12** to discharge through drain output **50**.

FIG. **3** depicts the pressurized backflushing system in a backflush mode. In the figure, bladder **17** is ready to propel the accumulator's supply of pressurized filtered fluid through backflush feed pipe **40** and output feed pipe **26**, into filter housing **12** and through filter element **14** in a reverse direction to the filtration mode. This propulsion of backflushing fluid dislodges contaminants suspended on filter element **14**, allowing their flow through drain output valve **46** and drain piping **50**.

In the sequencing of the backflushing operation, accumulator charging pump **30** is deactivated. Immediately before or after the deactivation, valve **42** and drain output valve **46** are opened while valves **22**, **32**, **34**, **36** are closed, thereby creating a fluid path from accumulator **16** through backflush feed pipe **40**, output feed pipe **26**, and onto filter element **14**. Bladder **17**, assisted in its release by the expansion of volume **19** of compressed inert gas, releases its stored backflush fluid in a method described above. After reaching an expanded state, or upon an actuation signal, bladder **17** of backflushing fluid accumulator **16** is again ready for repressurization from accumulator charging pump **30**. At this point, valve **42** and drain output valve **46** are closed and valves **22**, **32**, **34**, **36**, **42** are reopened. Accumulator charg-

ing pump **30** is re-activated, returning to replenishing bladder **17** with the filtration system returning to a normal filtering operation.

The foregoing description of the preferred embodiments of the invention has been presented for purposes of illustration and description. It is not intended to be exhaustive or to limit the invention to the precise form disclosed, and obviously many modifications and variations are possible in light of the above teaching. For example, the present invention may be utilized to sequentially backflush each of the individual filter units in a multiple filter system. Such modifications and variations that may be apparent to a person skilled in the art are intended to be included within the scope of this invention as defined by the accompanying claims.

I claim:

1. A pressurized backflushing apparatus comprising:

a filtering system including a filter housing containing a filter member therein, an input feed for introducing an unfiltered fluid into said filter housing, an output feed for removing filtered fluid from said filter housing, a backflush feed for introducing backflushing fluid into said filter housing, and a drain output for removing said backflushing fluid;

an accumulator charging pump which receives a portion of said filtered fluid, said accumulator charging pump producing a pressurized discharge of said filtered fluid;

an accumulator including an input port for receiving the filtered fluid from said accumulator charging pump discharge, a compressible inert gas section with a bladder to isolate said inert gas section, storing said filtered fluid to a pressure of approximately 300–600 psi such that the filtered fluid is propelled upon release from the accumulator through the backflush feed and the output feed into said filter housing, and through said filter member and out said drain output, thereby backflushing said filter member during a backflushing operation;

backflush feed valve means for controlling the flow of said backflushing fluid out of said accumulator through said backflush feed;

pump input feed valve means for controlling the flow of said filtered fluid into said accumulator charging pump;

pump output feed valve means for controlling the flow of said pressurized discharge out of said accumulator charging pump;

input feed valve means for controlling the flow of said unfiltered fluid into said filter housing through said input feed;

drain output valve means for controlling the removal of said backflushing fluid through said drain output;

output feed valve means for controlling the flow of said filtered output of said filter housing through said output feed and;

means for sequencing the actuation of said accumulator, said accumulator charging pump, said backflush valve means, said pump input feed valve means, said pump output feed valve means, said input feed valve means, said drain output valve means and said output feed valve means during a backflushing operation.

2. The filter backflushing apparatus according to claim **1** wherein, during said backflushing operation, said sequencing means is adapted to de-energize said accumulator charging pump and to close said pump input feed valve means, said pump output feed valve means, said input feed valve means and said output feed valve means, and to open said drain output valve means and said backflush feed valve means.

3. The filter backflushing apparatus according to claim **1** wherein, during said backflushing operation, said sequencing means is adapted to de-energize said accumulator pump and to close said pump input valve means said pump output valve means, said input feed valve means and said output feed valve means, and to open said drain output valve means and then opening said backflush feed valve means after a period substantially equal to the draining time of said filter housing.

4. The filter backflushing apparatus according to claim **1** wherein, during a filtering operation of said filtering system, said sequencing means is adapted to close said drain output valve means and said backflush feed valve means, and to open said input feed valve means, said pump input feed valve means, said pump output feed valve means and said output feed valve means remaining in an open state.

5. The filter backflushing apparatus according to claim **1** wherein said sequencing means further includes means for initiating said backflushing operation.

6. The filter backflushing apparatus according to claim **5** wherein said initiating means are actuated at a set pressure.

7. The filter backflushing apparatus according to claim **5** wherein said backflushing operation initiating means includes means for monitoring the fluid flow through said filter member.

8. The filter backflushing apparatus according to claim **5** wherein said backflushing operation initiating means includes means for monitoring the pressure in said accumulator.

9. The filter backflushing apparatus according to claim **1** wherein a volume of said bladder of said accumulator is substantially equivalent to or more than a volume of said filter housing.

10. A method of pressurized backflushing of a filtration system, said method comprising the steps of:

providing the apparatus of claim **1**;

deactivating said accumulator charging pump;

actuating in a simultaneous manner the pump output feed valve means, the pump input feed valve means, the input feed valve means and the output feed valve means such that each is in a closed state;

actuating the backflush feed valve means and the drain output valve means such that each valve is in an open state;

releasing said backwashing fluid stored within said accumulator; and

propelling said backwashing fluid through said filter member and onto said drain output with the result of a backflushed filtration system.

11. A method of pressurized backflushing of a filtration system, said method comprising the steps of:

providing the apparatus of claim **1**;

deactivating said accumulator charging pump;

activating the input feed valve means, the output feed valve means, the pump output feed valve means, and the pump input feed valve means such that each is in a closed state;

releasing said backwash fluid stored within said bladder;

propelling said backwash fluid through said filter member and onto said drain output with the result of a backflushed filtration system.

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US006190557B1

(12) **United States Patent**
Hisada et al.

(10) **Patent No.: US 6,190,557 B1**
(45) **Date of Patent: Feb. 20, 2001**

(54) **SPIRAL WOUND TYPE MEMBRANE ELEMENT, RUNNING METHOD AND WASHING METHOD THEREOF**

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(*) Notice: Under 35 U.S.C. 154(b), the term of this patent shall be extended for 0 days.

(21) Appl. No.: **08/986,554**

(22) Filed: **Dec. 8, 1997**

(30) **Foreign Application Priority Data**

Dec. 9, 1996 (JP) 8-328698
Feb. 19, 1997 (JP) 9-035188

(51) **Int. Cl.**7 .... **B01D 61/08**

(52) **U.S. Cl.** **210/650**; 210/321.76; 210/321.77; 210/321.85; 210/321.86; 210/407; 210/411; 210/437; 210/439; 210/448; 210/457; 210/487; 210/493.1; 210/497.01; 210/772

(58) **Field of Search** 210/650, 799, 210/407, 437, 448, 452, 493.1, 487, 411, 772, 321.77, 457, 321.76, 321.85, 439, 497.01, 321.86

(56) **References Cited**

U.S. PATENT DOCUMENTS

3,813,334 * 5/1974 Bray .
3,933,646 * 1/1976 Kanamaru et al. .
4,668,384 * 5/1987 Holman .
4,834,881 5/1989 Sawada et al. .
4,872,990 * 10/1989 Van Wijk .
5,290,446 * 3/1994 Degen et al. .

FOREIGN PATENT DOCUMENTS

56-28568 7/1981 (JP) .
59-162905 9/1984 (JP) .
64-47404 2/1989 (JP) .
64-51105 2/1989 (JP) .
8-141375 6/1996 (JP) .
8-196878 8/1996 (JP) .

* cited by examiner

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(57) **ABSTRACT**

A spiral wound type membrane element is formed by winding independent or continuous envelope-like membranes around the peripheral surface of a water collection pipe and interposing raw water spacers between the envelope-like membranes. When running, raw water is supplied from at least the periphery side of the spiral wound type membrane element and permeate is taken out from an opening end of the water collection pipe. In back wash reverse filtration, permeate is introduced from the opening end of the water collection pipe and permeate guided out from the peripheral surface of the water collection pipe is discharged from at least the periphery side of the spiral wound type membrane element.

29 Claims, 10 Drawing Sheets

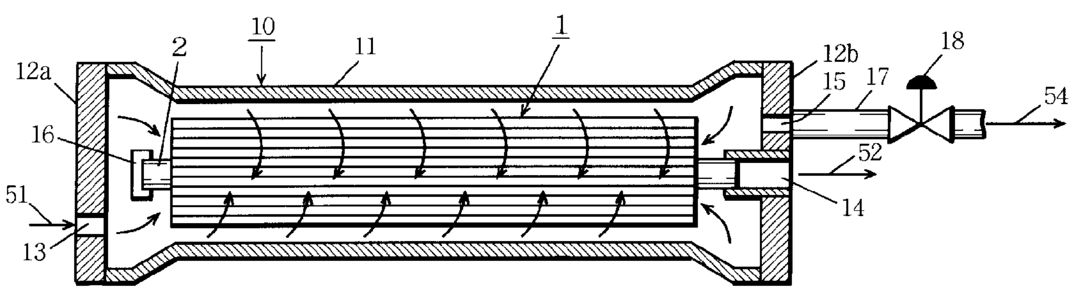


FIG. 1

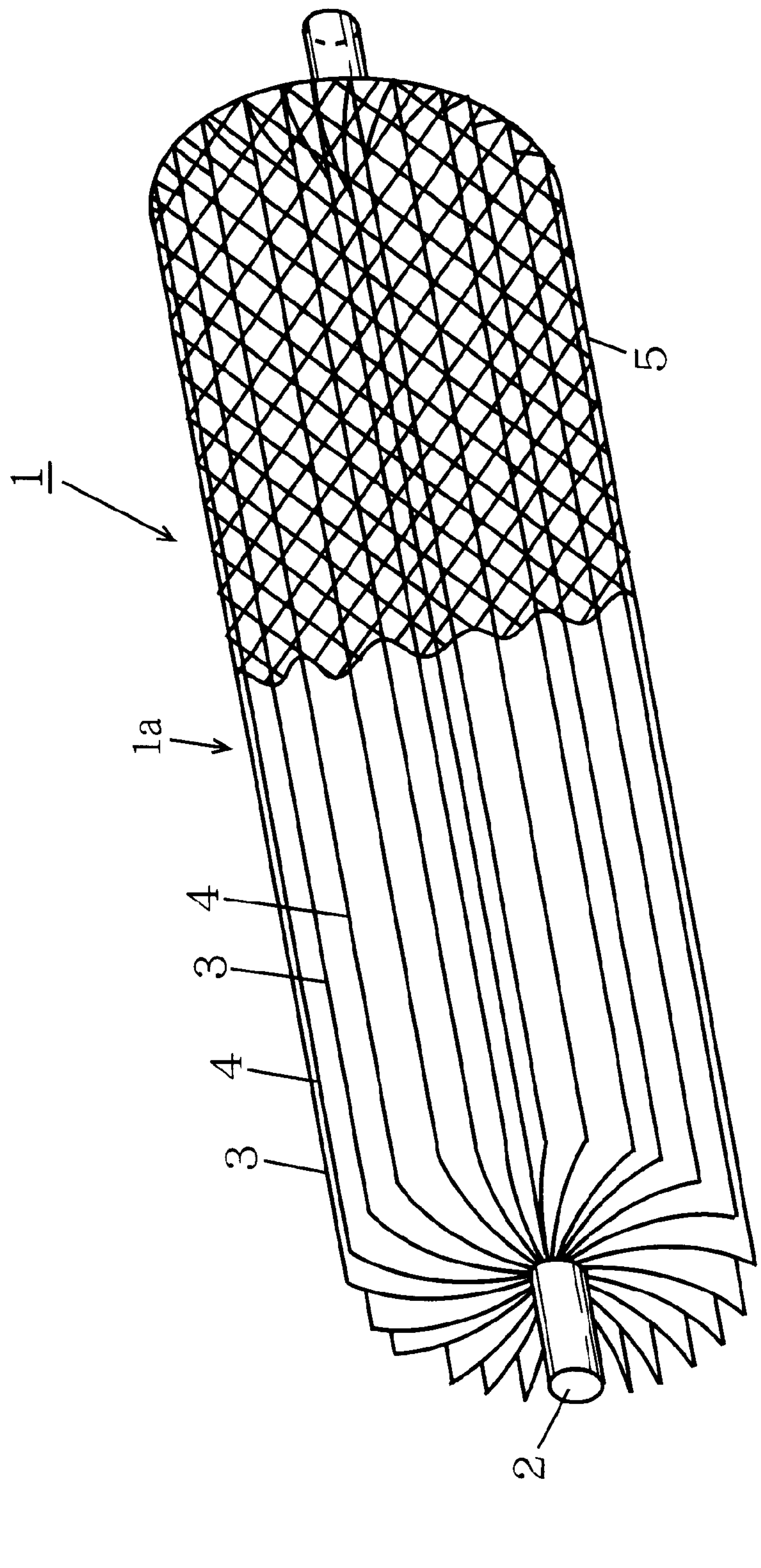
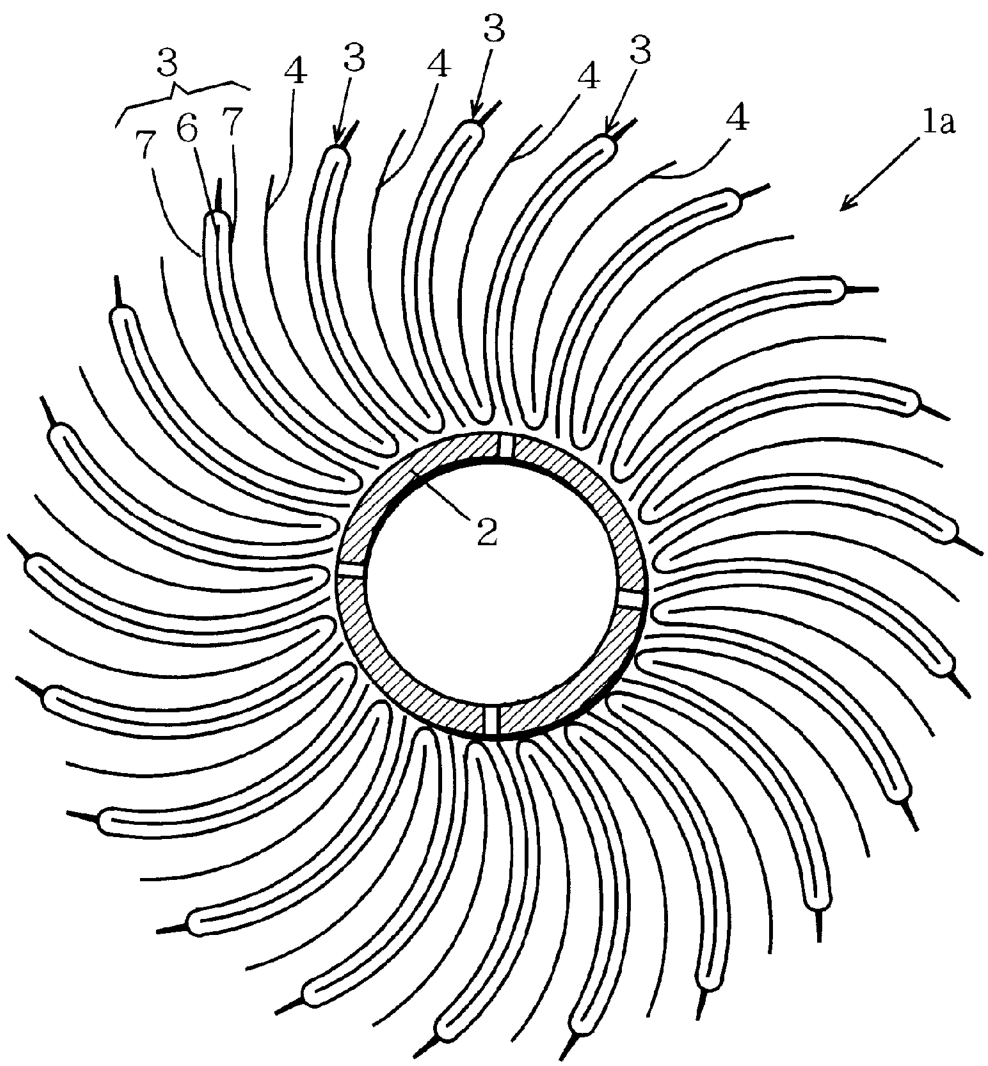
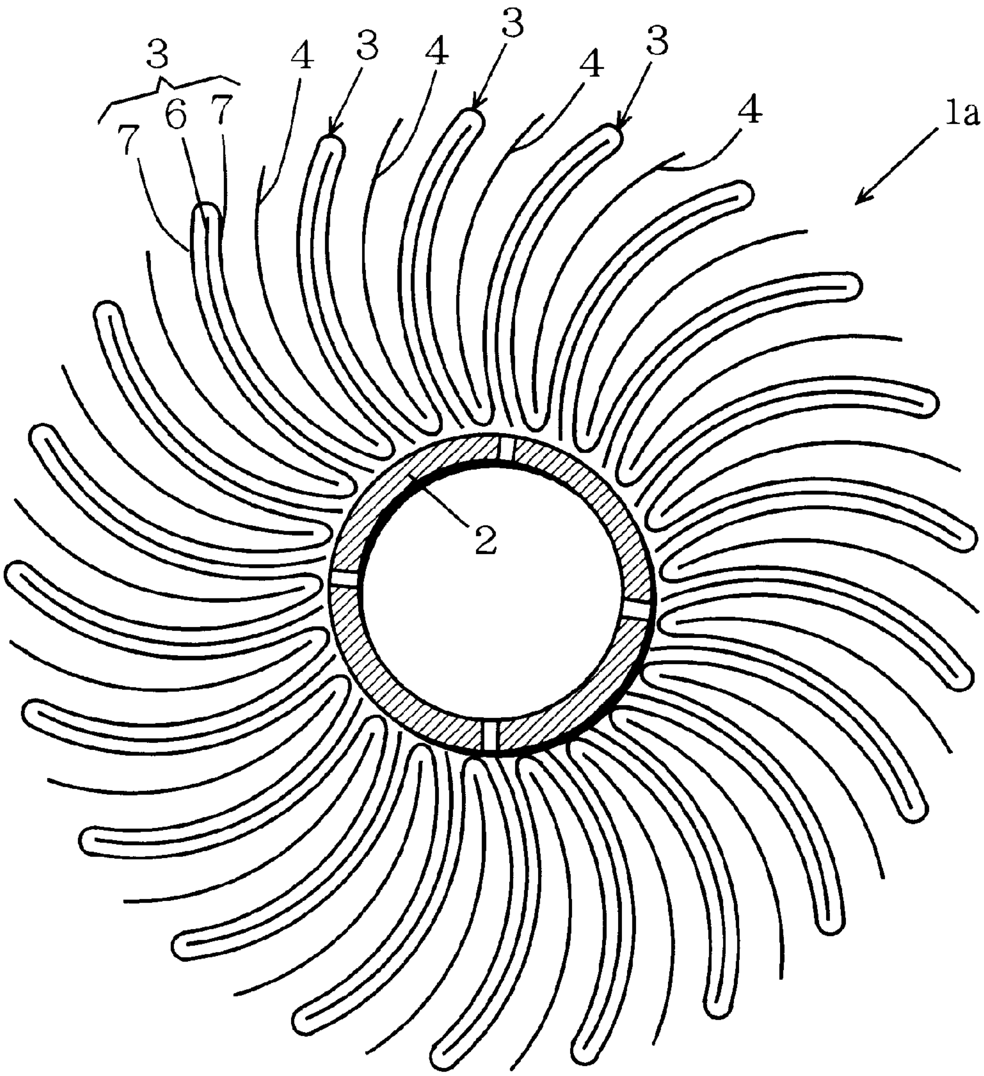


FIG. 2



F I G. 3



F I G. 4

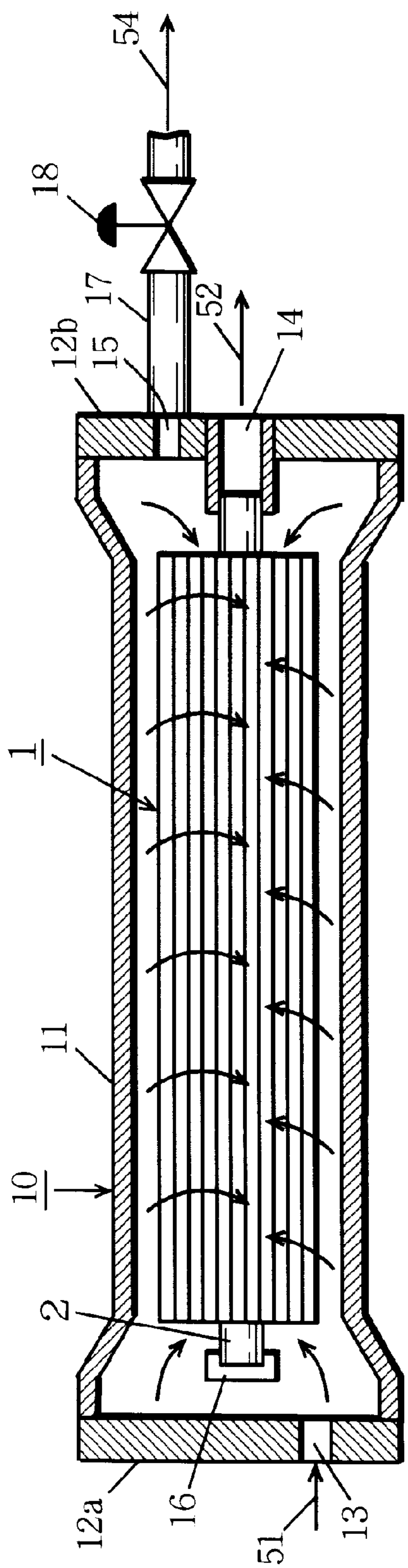


FIG. 5

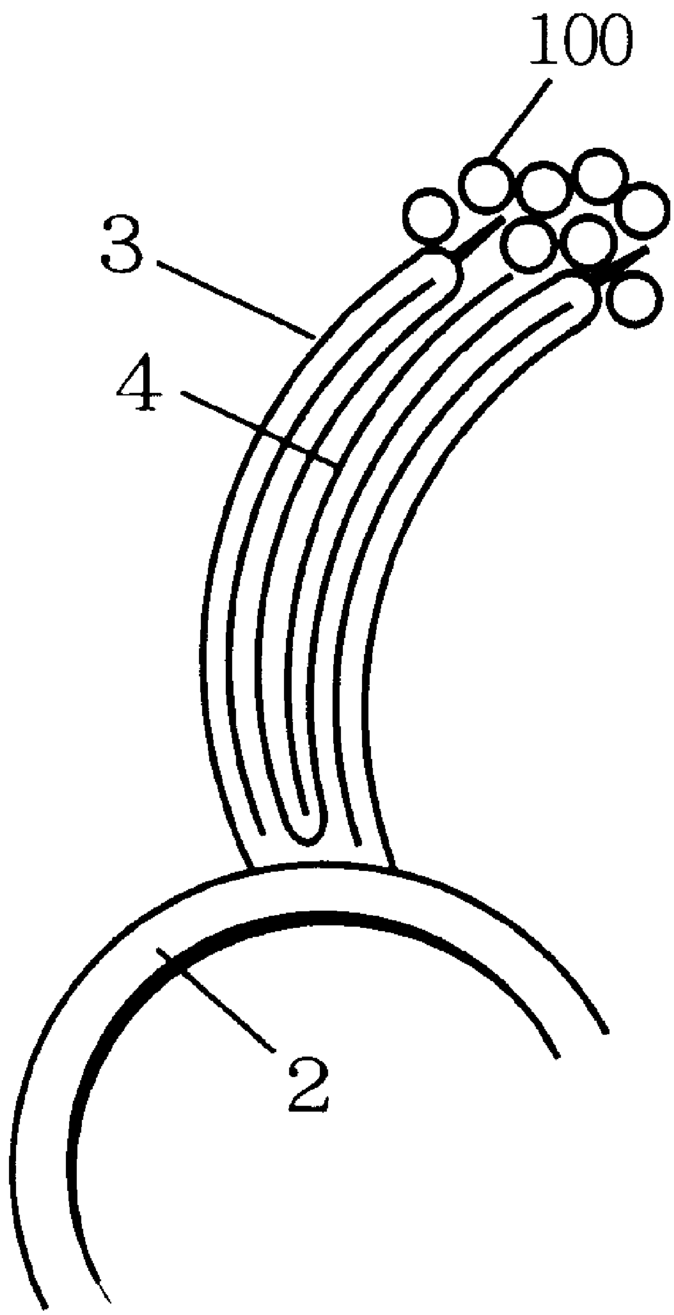


FIG. 6

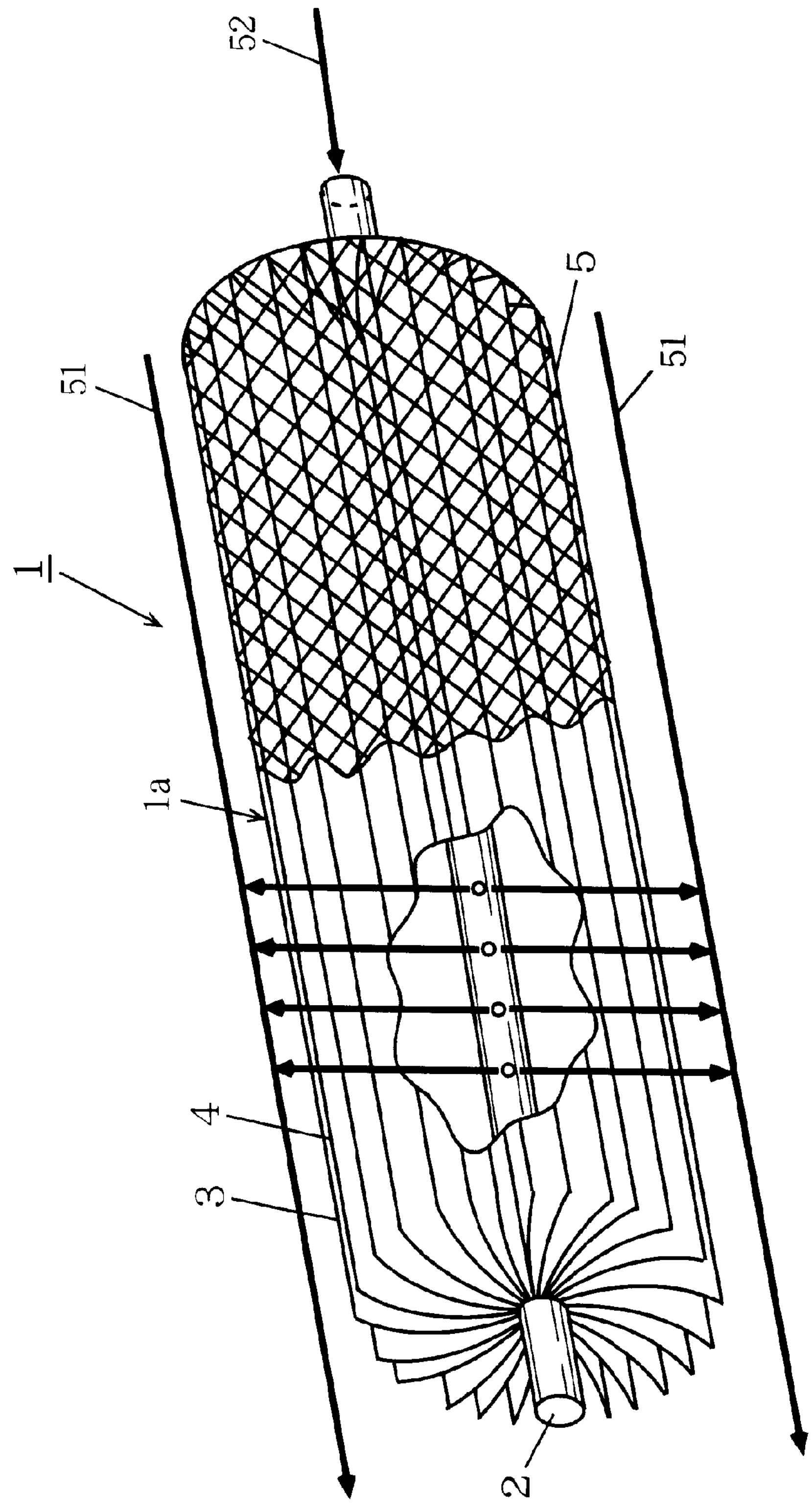


FIG. 7a

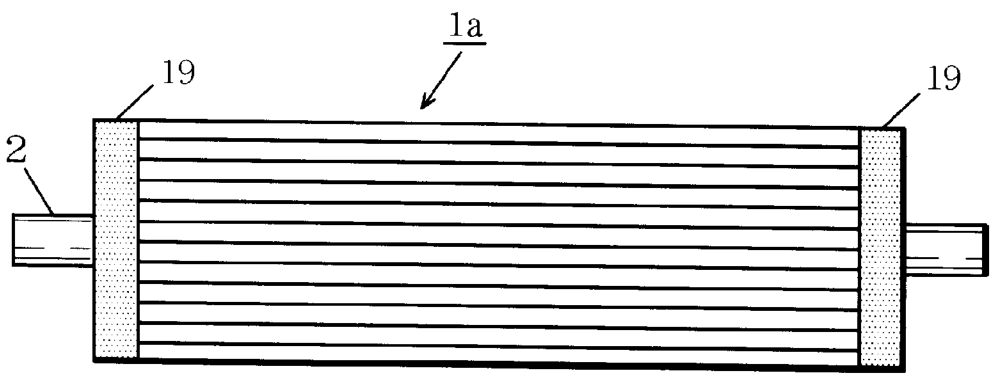


FIG. 7b

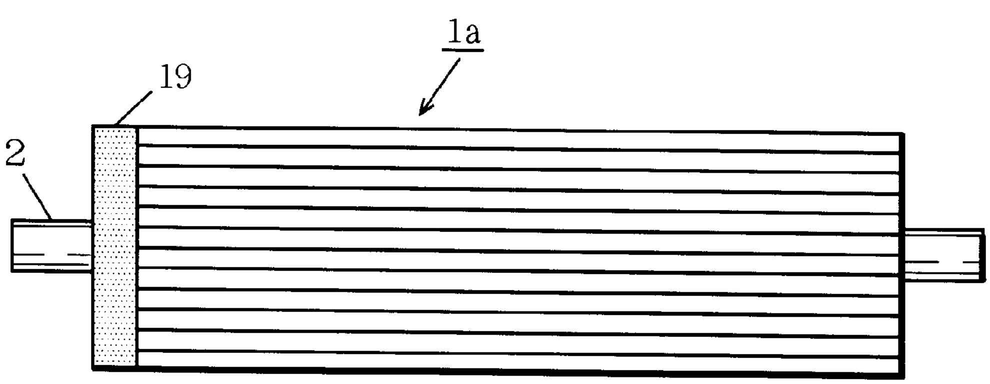


FIG. 8 PRIOR ART

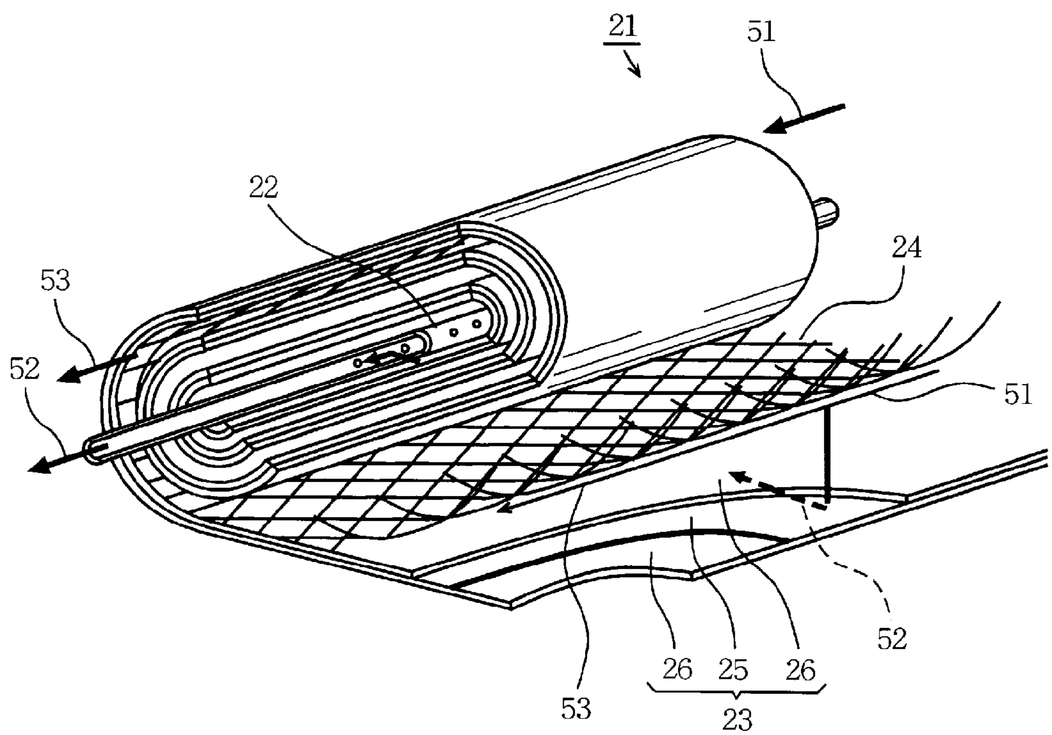


FIG. 9 PRIOR ART

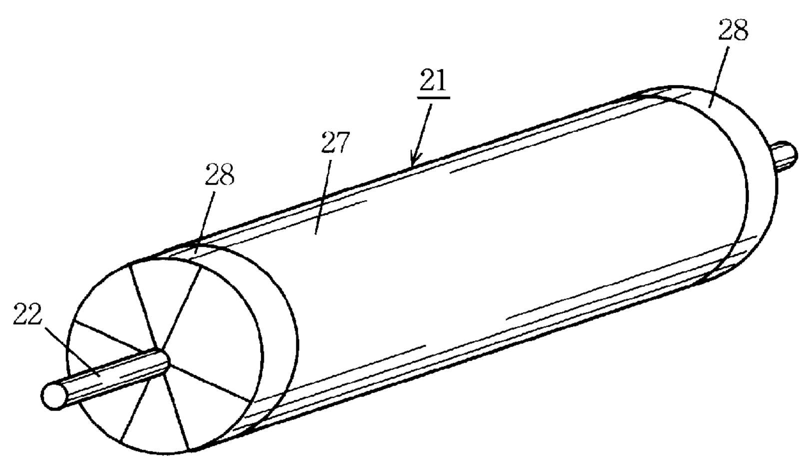


FIG. 10

PRIOR ART

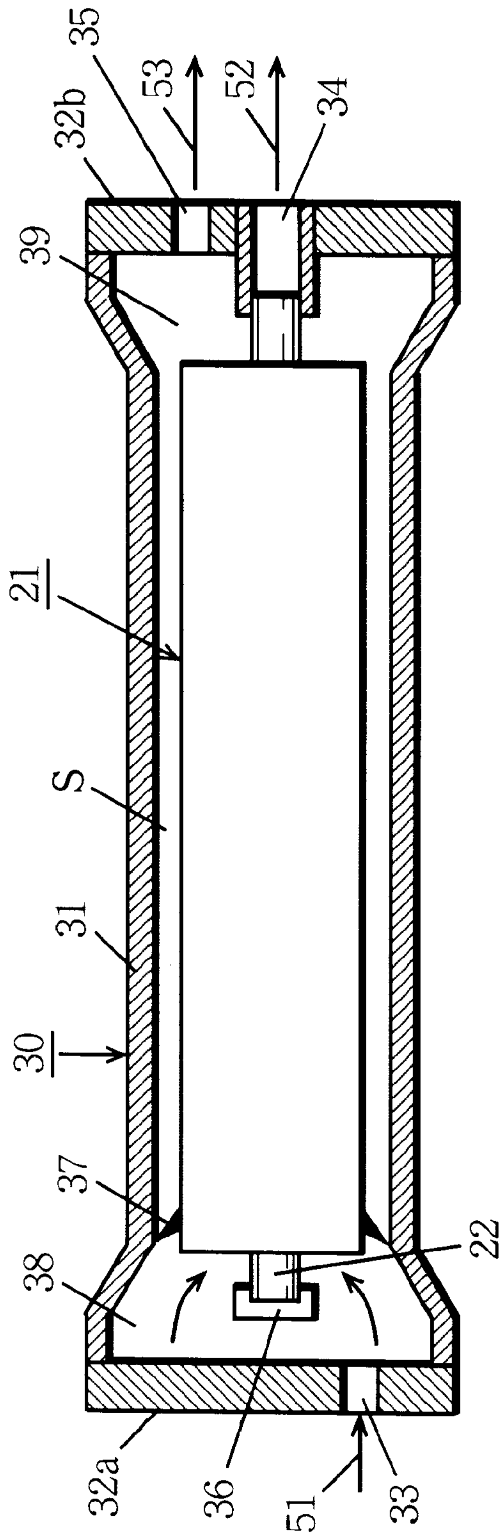
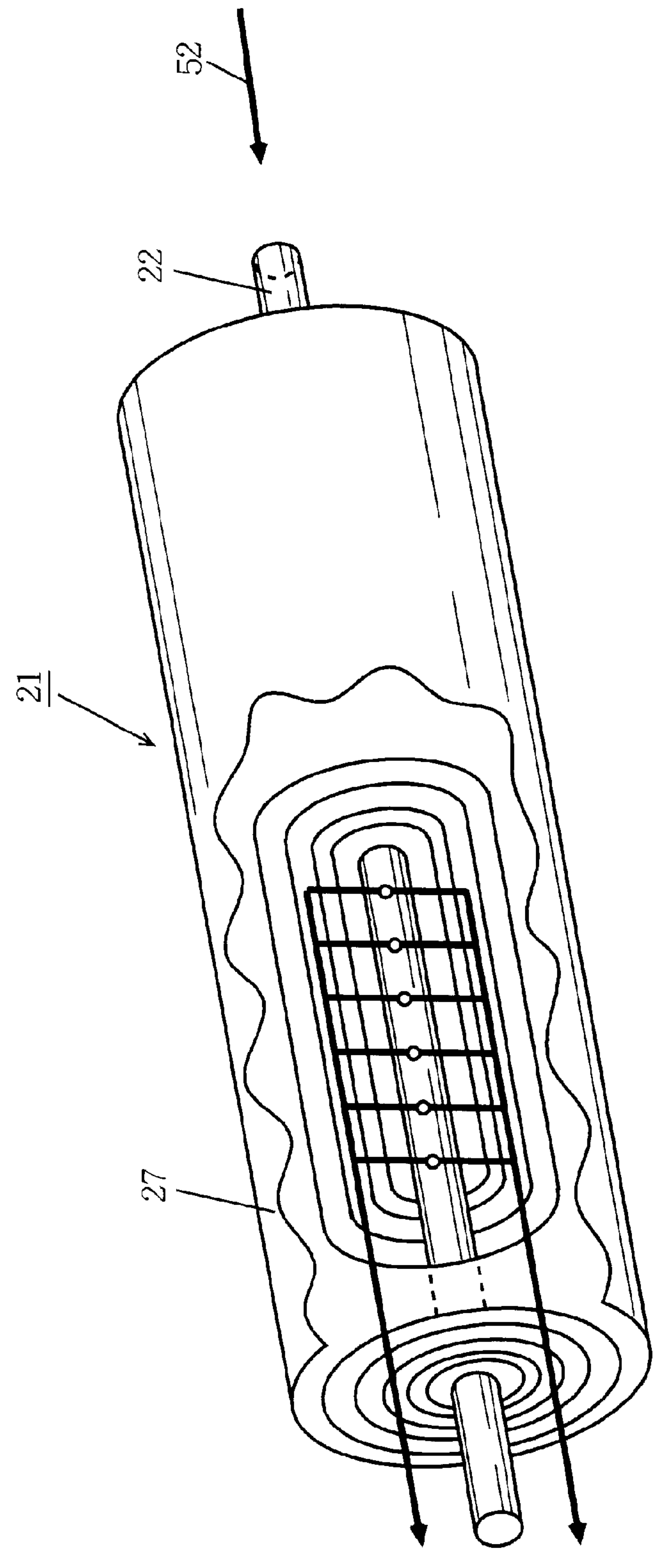


FIG. 11 CONVENTIONAL ART



SPIRAL WOUND TYPE MEMBRANE ELEMENT, RUNNING METHOD AND WASHING METHOD THEREOF

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a spiral wound type membrane element used in a membrane separation device such as a low-pressure reverse osmosis membrane separation device, an ultrafiltration device or a microfiltration device, and a method for running the same and a method for washing the same.

2. Description of the Background Art

With the recent trend toward applications of membrane separation technology to water-purification technology, the membrane separation technology is being applied as pretreatment for reverse osmosis membrane separation systems used to turn salt water into fresh water, for example. While microfiltration membranes and ultrafiltration membranes which provide large permeate flow rates are mainly used for such membrane separation, reverse osmosis membranes providing large permeate flow rates at ultra-low pressures of 10 kgf/cm^2 or lower are being developed these days.

As for membrane elements used for this kind of membrane separation, hollow fiber membrane elements are often used in view of membrane area per unit volume (volumetric efficiency). However, the hollow fiber membrane elements have the disadvantage that the membranes are easily broken. If the membrane is broken, raw water is mixed into permeate to lower the separating performance.

As for membrane elements providing large membrane area, there are spiral wound type membrane elements. As compared with the hollow fiber membrane elements, the spiral wound type membrane elements are more advantageous in that they can maintain high separating performance and thus provides higher reliability.

FIG. **8** is a partially cutaway perspective view of a conventional spiral wound type membrane element and FIG. **9** is an external perspective view of the conventional spiral wound type membrane element.

As shown in FIG. **8**, the spiral wound type membrane element **21** includes an envelope-like membrane (a bag-like membrane) **23** formed by putting separation membranes **26** on both sides of a permeate spacer **25** and bonding them together on three sides. The opening of the envelope-like membrane **23** is attached to a water collection pipe **22** formed of a perforated hollow pipe, and it is spirally wound around the water collection pipe **22** together with a net-like raw water spacer **24**.

The raw water spacer **24** is provided to form a passage through which the raw water passes between the envelope-like membrane **23**. If the thickness of the raw water spacer **24** is small, the separation membranes **26** can be efficiently accommodated but they will suffer from clogging with suspended substances. Accordingly, usually, the thickness of the raw water spacer **24** is set to about 0.7 to 3.0 mm.

A spiral wound type membrane element using a corrugating type raw water spacer (a so-called corrugating spacer) is already known, which is formed in a zig-zag shape to treat raw water, e.g., river water, containing a large quantity of suspended substances.

As shown in FIG. **9**, the peripheral surface of the spiral wound type membrane element **21** is covered by a sheath **27** formed of FRP (Fiber-Reinforced Plastics), a shrink tube, or the like, whose two ends are each equipped with a packing holder **28** called an anti-telescope.

FIG. **10** is a cross section showing an example of a method for running the conventional spiral wound type membrane element. As shown in FIG. **10**, a pressure vessel (a pressure-resisting vessel) **30** is formed of a tubular case **31** and a pair of end plates **32*a*** and **32*b***. One end plate **32*a*** has an inlet **33** for raw water and the other plate **32*b*** has an outlet **35** for concentrate. The other end plate **32*b*** also has an outlet **34** for permeate in the center.

The spiral wound type membrane element **21**, to which a packing **37** is attached on the peripheral surface in the vicinity of one end, is accommodated in the tubular case **31** and both of the opening ends of the tubular case **31** are sealed with the end plates **32*a*** and **32*b***. One opening end of the water collection pipe **22** is engaged with the permeate outlet **34** in the end plate **32*b***, and an end cap **36** is attached to the other opening end thereof.

When running the spiral wound type membrane element **21**, raw water **51** is introduced from the raw water inlet **33** of the pressure vessel **30** into a first liquid chamber **38**. As shown in FIG. **8**, the raw water **51** is supplied from one end of the spiral wound type membrane element **21**. The raw water **51** flows in the axial direction along the raw water spacer **24** and is discharged as concentrate **53** from the other end of the spiral wound type membrane element **21**. The raw water **51** passed through the separation membranes **26** while flowing along the raw water spacer **24** flows into the water collection pipe **22** as permeate **52** along the permeate spacer **25** and is discharged from the end of the water collection pipe **22**.

The permeate **52** is taken out from the permeate outlet **34** of the pressure vessel **30** shown in FIG. **10**. The concentrate **53** is taken out through the concentrate outlet **35** from a second liquid chamber **39** in the pressure vessel **30**.

When the membrane element is operated, the membrane is clogged with suspended substances in the raw water, which reduces the flux of permeate. Then the clogging substances are removed by chemical washing to recover the flux of permeate, which raises the problem that the chemical washing requires troublesome work and cost. Accordingly, with a hollow fiber membrane element, for example, it is periodically cleaned by back wash reverse filtration with permeate or air to prevent clogging. However, applying back wash reverse filtration to the conventional spiral wound type membrane element **21** causes the following problems.

FIG. **11** is a partially cutaway perspective view showing back wash reverse filtration operation with the conventional spiral wound type membrane element. As shown in FIG. **11**, permeate **52** is introduced from an end of the water collection pipe **22**. Since the peripheral surface of the envelope-like membrane **23** wound around the water collection pipe **22** is covered with the sheath **27**, the permeate guided out from the peripheral surface of the water collection pipe **22** permeates through the envelope-like membrane **23** to flow in the axial direction inside the membrane element **21** along the raw water spacer **24** and is discharged from the end of the membrane element **21**. Hence, contaminants such as suspended substances causing clogging are likely to be caught by the raw water spacer **24** before discharged to the end of the membrane element **21**, causing the problem that they are not sufficiently removed.

Furthermore, as shown in FIG. **10**, the gap between the inner peripheral surface of the tubular case **31** of the pressure vessel **30** and the spiral wound type membrane element **21** forms a dead space S, which causes the fluid to stay (fluid stay). When the spiral wound type membrane element **21** is used in a long time, the fluid staying in the dead space

deteriorates. Especially, if the fluid contains organic matter, various germs such as microorganisms propagate and decompose the organic matter to produce a bad smell, or may decompose the separation membranes, leading to reduction in reliability.

Moreover, since the raw water is supplied from one end of the spiral wound type membrane element **21** and is discharged from the other end, the conventional spiral wound type membrane element **21** requires the packing holders **28** to prevent the envelope-like membrane **23** wound around the water collection pipe **22** from being transformed into a shape like bamboo shoots. Further, pressure loss due to the raw water spacer **24** and pressure loss due to clogging produce a difference in pressure between the inflow of raw water and the outflow of concentrate, which deforms the spiral wound type membrane element **21**. In order to prevent deformation, the peripheral surface of the envelope-like membrane **23** wound around the water collection pipe **22** is covered with the sheath **27** formed of FRP, a shrink tube, or the like. This increases the parts cost and production cost.

Further, it is necessary to obtain sufficient linear velocity along the membrane surface to prevent formation of cake with contaminants in the raw water, which requires sufficient flow rate of concentrate. Increasing the flow rate of concentrate lowers recovery per membrane element and requires use of a large pump to supply the raw water, which largely increases the system cost.

SUMMARY OF THE INVENTION

An object of the present invention is to provide a spiral wound type membrane element capable of reducing costs, easy to wash, and providing high reliability and a method for running the same.

Another object of the present invention is to provide a washing method which can easily and certainly remove contaminants caught by the spiral wound type membrane element.

According to the present invention, a spiral wound type membrane element includes a spiral membrane component, and the spiral membrane component includes a perforated hollow pipe, a plurality of independent or continuous envelope-like membranes wound around the peripheral surface of the perforated hollow pipe, and raw liquid passage forming members interposed between the plurality of envelope-like membranes, wherein raw liquid is supplied from the peripheral side and both end sides of the spiral membrane component and permeate is guided out from at least one opening end of the perforated hollow pipe.

In the spiral wound type membrane element, the peripheral surface and both ends of the spiral membrane component are not covered with a sheath but are opened. Accordingly, raw liquid can be supplied from the periphery and both ends of the membrane element to perform dead end filtration.

Since raw liquid is thus supplied from the peripheral side and both end sides of the membrane element, contaminants are caught at the periphery and both ends of the membrane element. This enables uniform removal of contaminants with back wash reverse filtration using permeate, for example.

According to the structure of the invention, no dead space is formed in the gap between the membrane element and the pressure vessel since dead end filtration is performed. This prevents the fluid from staying in the gap between the membrane element and the pressure vessel. Therefore, even if it is used for separation of fluid containing organic matter, no problem is caused by propagation of various germs such as microorganisms, generation of a bad smell due to decomposition of organic matter, decomposition of the separation membranes, etc., thus providing high reliability.

Furthermore, since raw liquid is supplied from the periphery and both ends of the membrane element, pressures are applied to the membrane element from all directions. Since such pressure as may cause deformation in the axial direction is not applied, the envelope-like membranes wound around the perforated hollow pipe are not deformed into a shape like bamboo shoots. This eliminates the necessity of using packing holders and a sheath, thus reducing the parts cost and production cost. The dead end filtration provides high recovery without the necessity of using a large pump to supply raw liquid. This reduces the system cost.

Moreover, since pressures are applied to the membrane element from all directions, the membrane element is not deformed even if the raw liquid is supplied at high pressure. This provides good pressure resistance.

According to another aspect of the present invention, a spiral wound type membrane element includes a spiral membrane component, and the spiral membrane component includes a perforated hollow pipe, a plurality of independent or continuous envelope-like membranes wound around the peripheral surface of the perforated hollow pipe, and raw liquid passage forming members interposed between the plurality of envelope-like membranes, wherein the spiral membrane component is sealed at its one end, and raw liquid is supplied from the peripheral side and the other end side of the spiral membrane component and permeate is guided out from at least one opening end of the perforated hollow pipe.

In the spiral wound type membrane element, the peripheral surface and one end of the spiral membrane component are not covered with a sheath but are opened. Accordingly, raw liquid can be supplied from the periphery and one end of the membrane element to perform dead end filtration.

Since raw liquid is thus supplied from the peripheral side and one end side of the membrane element, contaminants are caught on the periphery and the one end of the membrane element. This enables uniform removal of the contaminants in back wash reverse filtration with, e.g., permeate.

Particularly, since no space is required for supply of raw liquid on the sealed end side of the membrane element, it is possible to reduce the size of the pressure vessel for accommodating the membrane element. It is also possible, by positioning the sealed end of the membrane element on the raw liquid inlet side in the pressure vessel, to prevent adhesion of dirt on the end of the spiral membrane component due to dynamic pressure of raw liquid when raw liquid is introduced.

According to the structure of the invention, as well, no dead space is formed in the gap between the membrane element and the pressure vessel since dead end filtration is performed. Hence, no problem is encountered due to propagation of various germs such as microorganisms, generation of a bad smell caused by decomposition of organic matter, decomposition of the separation membranes, etc., thus providing high reliability.

Furthermore, since pressures are applied to the membrane element from all directions, without application of such pressure as may cause deformation in the axial direction, the envelope-like membranes wound around the perforated hollow pipe are not deformed into a shape like bamboo shoots. This eliminates the necessity of using packing holders and a sheath, thus reducing the parts cost and production cost. The dead end filtration provides excellent recovery without the

necessity of using a large pump to supply raw liquid. This reduces the system cost.

Moreover, since pressures are applied to the membrane element from all directions, the membrane element is not deformed even if the pressure for supply of raw liquid is high. This provides good pressure resistance.

According to still another aspect of the present invention, a spiral wound type membrane element includes a spiral membrane component, and the spiral membrane component includes a perforated hollow pipe, a plurality of independent or continuous envelope-like membranes wound around the peripheral surface of the perforated hollow pipe, and raw liquid passage forming members interposed between the plurality of envelope-like membranes, wherein the spiral membrane component is sealed on both ends, and raw liquid is supplied from the peripheral side of the spiral membrane component and permeate is guided out from at least one opening end of the perforated hollow pipe.

In the spiral wound type membrane element, the peripheral surface of the spiral membrane component is not covered with a sheath but is opened. Accordingly, raw liquid can be supplied from the peripheral side of the membrane element to perform dead end filtration.

Since raw liquid is thus supplied from the periphery of the membrane element, contaminants are caught on the periphery of the membrane element. Then the contaminants can be uniformly removed by back wash reverse filtration using permeate, for example.

Particularly, since no space is required for supply of raw liquid at the sealed ends of the membrane element, the pressure vessel for accommodating the membrane element can be reduced in size. Further, it is possible, by positioning one of the sealed ends of the membrane element on the raw liquid inlet side in the pressure vessel, to prevent dirt from attaching to the end of the spiral membrane component due to dynamic pressure of raw liquid when raw liquid is introduced.

According to the structure of the invention, too, no dead space is formed in the gap between the membrane element and the pressure vessel since dead end filtration is performed. Hence, no problem is encountered due to propagation of various germs such as microorganisms, generation of a bad smell caused by decomposition of organic matter, decomposition of the separation membranes, etc., thus providing high reliability.

Furthermore, since pressures are applied to the membrane element from all directions, instead of such application of pressure as may cause deformation in the axial direction, the envelope-like membranes wound around the perforated hollow pipe are not deformed into a shape like bamboo shoots. This eliminates the necessity of using packing holders and a sheath, thus reducing the parts cost and production cost. The dead end filtration eliminates the necessity of using a large pump to supply raw liquid while providing high recovery. This reduces the system cost.

Moreover, since pressures are applied to the membrane element in all directions, the membrane element is not deformed even if the pressure for supply of raw liquid is high. This provides good pressure resistance.

With the above-described spiral wound type membrane element, it is preferred that the periphery of the spiral membrane component is covered with a peripheral passage forming member. With a conventional spiral wound type membrane element, contaminants are caught at the raw water spacer before discharged from one end of the membrane element in back wash reverse filtration with permeate or the like. In contrast, with the spiral wound type membrane element of the present invention performing filtration with the above-described structure, the contaminants are caught on at least the periphery of the membrane element and easily come off from the separation membranes in back wash reverse filtration. If the periphery of the spiral membrane component is covered with a peripheral passage forming member, a space is ensured between the membrane element and the pressure vessel. As a result, it is possible to easily discharge the contaminants coming off from at least the periphery of the membrane element out of the system through the space.

It is preferred that the peripheral passage forming member has a thickness of not less than 0.6 mm nor more than 30 mm. It is then possible in back wash reverse filtration to discharge contaminants attached to at least the periphery of the membrane element out of the system while maintaining large volumetric efficiency of the membrane element with respect to the pressure vessel.

It is preferred that the raw liquid passage forming members have a thickness of not less than 0.1 mm nor more than 0.5 mm. Then it is possible to obtain a high accommodation efficiency of the separation membranes while ensuring a passage for raw liquid and to catch contaminants at at least the periphery of the membrane element. Then the contaminants can be removed easily by back wash reverse filtration operation by using permeate or the like.

Each of the plurality of envelope-like membranes may include two separation membranes and a permeate passage forming member interposed between the two separation membranes, in which the two separation membranes are bonded together on three sides and the opening of the envelope-like membrane is attached to the peripheral surface of the perforated hollow pipe. The envelope-like membrane is preferably formed of a low-pressure reverse osmosis membrane, an ultrafiltration membrane or a microfiltration membrane.

The peripheral passage forming member may be formed of a net of plastic, metal, rubber, or fiber.

The spiral wound type membrane element may further include a pressure vessel in which the spiral membrane component is accommodated.

A further aspect of the present invention is directed to a method(A) for running a spiral wound type membrane element having a perforated hollow pipe, a plurality of independent or continuous envelope-like membranes wound around the peripheral surface of the perforated hollow pipe, and raw liquid passage forming members interposed between the plurality of envelope-like membranes, and the running method includes the steps of supplying raw liquid from the peripheral side and both end sides of the spiral wound type membrane element and taking out permeate from at least one opening end of the perforated hollow pipe.

According to the spiral wound type membrane element running method(A), contaminants are caught on the periphery and both ends of the membrane element, which enables uniform removal of contaminants in back wash reverse filtration with permeate or the like. Further, filtration is performed in such a manner that no dead space is formed around the periphery of the membrane element, which prevents propagation of various germs such as microorganisms, generation of a bad smell due to decomposition of organic matter, and decomposition of the separation membranes, thus providing high reliability.

Further, pressures are applied to the membrane element from all directions, which eliminates the problem of defor-

mation of the membrane element and eliminates the necessity of using packing holders and a sheath. Moreover, the dead end filtration eliminates the necessity of using a large pump to supply raw liquid. This reduces the costs.

A further aspect of the present invention is directed to a method(A) for running a spiral wound type membrane element having a perforated hollow pipe, a plurality of independent or continuous envelope-like membranes wound around the peripheral surface of the perforated hollow pipe, and raw liquid passage forming members interposed between the plurality of envelope-like membranes, wherein the spiral wound type membrane element has its one end sealed, and the running method includes the steps of supplying raw liquid from the peripheral side and the other end side of the spiral wound type membrane element and taking out permeate from at least one opening end of the perforated hollow pipe.

According to the spiral wound type membrane element running method(A), contaminants are caught at the periphery and one end of the membrane element, which enables uniform removal of contaminants in back wash reverse filtration with permeate or the like.

Particularly, since no space is required for supply of raw liquid on the sealed end side of the membrane element, a small-sized pressure vessel can be used. When the sealed end of the membrane element is positioned on the raw liquid inlet side in the pressure vessel, it is possible to prevent dirt from attaching to the end of the membrane element due to dynamic pressure of raw liquid when raw liquid is introduced.

Further, dead end filtration forms no dead space around the periphery of the membrane element, thus preventing propagation of various germs such as microorganisms, generation of a bad smell due to decomposition of organic matter, decomposition of the separation membranes, and providing high reliability.

Further, pressures are applied to the membrane element from all directions, which eliminates the problem of deformation of the membrane element and eliminates the necessity of using packing holders and a sheath. Moreover, the dead end filtration eliminates the necessity of using a large pump to supply raw liquid. This reduces the costs.

A further aspect of the present invention is directed to a method(A) for running a spiral wound type membrane element having a perforated hollow pipe, a plurality of independent or continuous envelope-like membranes wound around the peripheral surface of the perforated hollow pipe, and raw liquid passage forming members interposed between the plurality of envelope-like membranes, wherein the spiral wound type membrane element has both its ends sealed, and the running method includes the steps of supplying raw liquid from the peripheral side of the spiral wound type membrane element and taking out permeate from at least one opening end of the perforated hollow pipe.

According to the spiral wound type membrane element running method(A), contaminants are caught on the periphery of the membrane element, which enables uniform removal of contaminants in back wash reverse filtration with permeate or the like.

Particularly, since no space is required for supply of raw liquid at both ends of the membrane element, a small-sized pressure vessel can be used. When one of the sealed ends of the membrane element is positioned on the raw liquid inlet side of the pressure vessel, it is possible to prevent dirt from attaching to the end of the membrane element due to dynamic pressure of the raw liquid when raw liquid is introduced.

Further, dead end filtration forms no dead space around the periphery of the membrane element, thus preventing problems caused by propagation of various germs such as microorganisms, generation of a bad smell due to decomposition of organic matter, decomposition of the separation membrane, and providing high reliability.

Further, pressures are applied to the membrane element from all directions, which eliminates the problem of deformation of the membrane element and eliminates the necessity of using packing holders and a sheath. Moreover, the dead end filtration eliminates the necessity of using a large pump to supply raw liquid. This reduces the costs.

Still another aspect of the present invention is directed to a method for washing a spiral wound type membrane element having a perforated hollow pipe, a plurality of independent or continuous envelope-like membranes wound around the peripheral surface of the perforated hollow pipe, and raw liquid passage forming members interposed between the plurality of envelope-like membranes, and the washing method includes the steps of introducing a washing liquid from at least one opening end of the perforated hollow pipe, and discharging the washing liquid guided out from the peripheral surface of the perforated hollow pipe from the periphery and both ends of the spiral wound type membrane element.

Since the peripheral surface and both ends of the above-described spiral wound type membrane element are not covered with a sheath but are opened, it is possible to supply raw liquid from the peripheral side and both end sides of the membrane element to perform dead end filtration. In this case, contaminants are caught on the periphery and both ends of the membrane element.

When washing, a washing liquid introduced from at least one opening end of the perforated hollow pipe is guided out from the peripheral surface of the perforated hollow pipe and passes through the envelope-like membranes to flow along the raw liquid passage forming members, and is discharged from the periphery and both ends of the spiral wound type membrane element. Then contaminants caught on the periphery and both ends of the membrane element come off from the membrane element and are discharged out of the system with the washing liquid. The contaminants caught on the periphery and both ends of the membrane element can thus be uniformly removed.

A further aspect of the present invention is directed to a method for washing a spiral wound type membrane element having a perforated hollow pipe, a plurality of independent or continuous envelope-like membranes wound around the peripheral surface of the perforated hollow pipe, and raw liquid passage forming members interposed between the plurality of envelope-like membranes, the spiral wound type membrane element having its one end sealed, and the washing method includes the steps of introducing a washing liquid from at least one opening end of the perforated hollow pipe, and discharging the washing liquid guided out from the peripheral surface of the perforated hollow pipe from the periphery and the other end of the spiral wound type membrane element.

Since the peripheral surface and one end of the above-described spiral wound type membrane element are not covered with a sheath but are opened, it is possible to supply raw liquid from the peripheral side and one end side of the membrane element to perform dead end filtration. In this case, contaminants are caught at the periphery and one end of the membrane element.

When washing, a washing liquid introduced from at least one opening end of the perforated hollow pipe is guided out

from the peripheral surface of the perforated hollow pipe and passes through the envelope-like membranes to flow along the raw liquid passage forming members, and is discharged from the periphery and one end of the spiral wound type membrane element. Then contaminants caught at the periphery and one end of the membrane element come off from the membrane element and are discharged out of the system with the washing liquid. The contaminants caught at the periphery and one end of the membrane element can thus be uniformly removed.

A further aspect of the present invention is directed to a method for washing a spiral wound type membrane element having a perforated hollow pipe, a plurality of independent or continuous envelope-like membranes wound around the peripheral surface of the perforated hollow pipe, and raw liquid passage forming members interposed between the plurality of envelope-like membranes, the spiral wound type membrane element having both its ends sealed, and the washing method includes the steps of introducing a washing liquid from at least one opening end of the perforated hollow pipe, and discharging the washing liquid guided out from the peripheral surface of the perforated hollow pipe from the periphery of the spiral wound type membrane element.

Since the peripheral surface of the above-described spiral wound type membrane element is not covered with a sheath but is opened, it is possible to supply raw liquid from the periphery of the membrane element to perform dead end filtration. In this case, contaminants are caught on the periphery of the membrane element.

When washing, a washing liquid introduced from at least one opening end of the perforated hollow pipe is guided out from the peripheral surface of the perforated hollow pipe and passes through the envelope-like membranes to flow along the raw liquid passage forming members, and is discharged from the periphery of the membrane element. Then contaminants caught on the periphery of the membrane element come off from the membrane element and are discharged out of the system with the washing liquid. The contaminants caught on the periphery of the membrane element can thus be uniformly removed.

In the spiral wound type membrane element washing method, it is preferable to cause raw liquid to flow in the axial direction along the periphery of the spiral wound type membrane element. Then it is possible to easily make the contaminants attached to the periphery of the membrane element come off and to easily and certainly discharge the contaminants coming off from the membrane element from the system.

In the above-described spiral wound type membrane element washing method, permeate may be used as the washing liquid.

Still another aspect of the present invention is directed to a method(B) for running a spiral wound type membrane element having a perforated hollow pipe, a plurality of independent or continuous envelope-like membranes wound around the peripheral surface of the perforated hollow pipe, and raw liquid passage forming members interposed between the plurality of envelope-like membranes, and the running method includes the steps of, when running, supplying raw liquid from the peripheral side and both end sides of the spiral wound type membrane element and taking out permeate from at least one opening end of the perforated hollow pipe, and when washing, introducing permeate from at least one opening end of the perforated hollow pipe and discharging the permeate guided out from the peripheral surface of the perforated hollow pipe from the periphery and both ends of the spiral wound type membrane element.

According to the spiral wound type membrane element running method(B), when running, raw liquid is supplied from the periphery and both ends of the membrane element and dead end filtration is performed. In this case, contaminants are caught at the periphery and both ends of the membrane element.

When washing, permeate introduced from at least one opening end of the perforated hollow pipe is guided out from the peripheral surface of the perforated hollow pipe and passes through the envelope-like membranes to flow along the raw liquid passage forming members, and is discharged from the periphery and both ends of the membrane element. Then contaminants caught at the periphery and both ends of the membrane element come off from the membrane element and are discharged out of the system with the permeate. The contaminants caught at the periphery and both ends of the membrane element can thus be uniformly removed, and then stable permeate flow rate is always maintained while running.

Since no dead space S is formed in the gap between the membrane element and the pressure vessel since dead end filtration is performed, fluid does not stay in the gap between the membrane element and the pressure vessel. Therefore, even if it is used for separation of fluid containing organic matter, no problem is encountered due to propagation of various germs such as microorganisms, generation of a bad smell caused by decomposition of organic matter, decomposition of the separation membranes, etc., thus providing high reliability.

Furthermore, since raw liquid is supplied from the peripheral side and both end sides of the membrane element, pressures are applied to the membrane element from all directions, instead of such application of pressure as may cause deformation in the axial direction, and then the envelope-like membranes wound around the perforated hollow pipe are not deformed into a shape like bamboo shoots. This eliminates the necessity of using packing holders and a sheath, thus reducing the parts cost and production cost. The dead end filtration provides high recovery without the necessity of using a large pump to supply raw liquid. This reduces the system cost.

A further aspect of the present invention is directed to a method(B) for running a spiral wound type membrane element having a perforated hollow pipe, a plurality of independent or continuous envelope-like membranes wound around the peripheral surface of the perforated hollow pipe, and raw liquid passage forming members interposed between the plurality of envelope-like membranes, the spiral wound type membrane element having its one end sealed, and the running method includes the steps of, when running, supplying raw liquid from the peripheral side and the other end side of the spiral wound type membrane element and taking out permeate from at least one opening end of the perforated hollow pipe, and when washing, introducing permeate from at least one opening end of the perforated hollow pipe and discharging the permeate guided out from the peripheral surface of the perforated hollow pipe from the periphery and the other end of the spiral wound type membrane element.

According to the spiral wound type membrane element running method(B), when running, raw liquid is supplied from the periphery and one end of the membrane element and dead end filtration is performed. In this case, contaminants are caught on the periphery and one end of the membrane element.

When washing, permeate introduced from at least one opening end of the perforated hollow pipe is guided out from

the peripheral surface of the perforated hollow pipe and passes through the envelope-like membranes to flow along the raw liquid passage forming members, and is discharged from the periphery and one end of the membrane element. Then contaminants caught on the periphery and one end of the membrane element come off from the membrane element and are discharged out of the system with the permeate. The contaminants caught on the periphery and one end of the membrane element can thus be uniformly removed, thus enabling a stable permeate flow rate to be always maintained while running.

Particularly, since no space is required for supply of raw liquid on the sealed end side of the membrane element, a pressure vessel of a small size can be used. Further, when the sealed end of the membrane element is positioned on the raw liquid inlet side in the pressure vessel, it is possible to prevent adhesion of dirt at the end of the membrane element due to dynamic pressure of raw liquid when raw liquid is introduced.

No dead space S is formed around the membrane element since dead end filtration is performed, no problem is therefore caused by propagation of various germs such as microorganisms, generation of a bad smell due to decomposition of organic matter, decomposition of the separation membranes, etc., thus providing high reliability.

Furthermore, since pressures are applied to the membrane element from all directions, the membrane element is not deformed, which eliminates the necessity of using packing holders and a sheath. Further, the dead end filtration eliminates the necessity of using a large pump to supply raw liquid. This reduces the costs.

A further aspect of the present invention is directed to a method(B) for running a spiral wound type membrane element having a perforated hollow pipe, a plurality of independent or continuous envelope-like membranes wound around the peripheral surface of the perforated hollow pipe, and raw liquid passage forming members interposed between the plurality of envelope-like membranes, the spiral wound type membrane element having both its ends sealed, and the running method includes the steps of, when running, supplying raw liquid from the peripheral side of the spiral wound type membrane element and taking out permeate from at least one opening end of the perforated hollow pipe, and when washing, introducing permeate from at least one opening end of the perforated hollow pipe and discharging the permeate guided out from the peripheral surface of the perforated hollow pipe from the periphery of the spiral wound type membrane element.

According to the spiral wound type membrane element running method(B), when running, raw liquid is supplied from the periphery of the membrane element and dead end filtration is performed. In this case, contaminants are caught on the periphery of the membrane element.

When washing, permeate introduced from at least one opening end of the perforated hollow pipe is guided out from the peripheral surface of the perforated hollow pipe and passes through the envelope-like membranes to flow along the raw liquid passage forming members, and is discharged from the periphery of the membrane element. Then contaminants caught at the periphery of the membrane element come off and are discharged out of the system with the permeate. The contaminants caught at the periphery of the membrane element can thus be uniformly removed, thus always keeping a stable permeate flow rate while running.

Particularly, since no space is required for supply of raw liquid at both ends of the membrane element, a pressure vessel of a small size can be used. Further, when one of the sealed ends of the membrane element is positioned on the raw liquid inlet side in the pressure vessel, it is possible to prevent dirt from attaching to the end of the membrane element due to dynamic pressure of raw liquid when raw liquid is introduced.

No dead space S is formed around the membrane element since dead end filtration is performed, no problem is therefore encountered due to propagation of various germs such as microorganisms, generation of a bad smell caused by decomposition of organic matter, decomposition of the separation membranes, etc., thus providing high reliability.

Furthermore, since pressures are applied to the membrane element from all directions, the membrane element is not deformed, which eliminates the necessity of using packing holders and a sheath. Further, the dead end filtration eliminates the necessity of using a large pump to supply raw liquid. This reduces the costs.

In the above-described spiral wound type membrane element running method(B), it is preferable to cause raw liquid to flow in the axial direction along the periphery of the spiral wound type membrane element when washing. Then it is possible to easily make the contaminants attached on the periphery of the membrane element come off and to easily and certainly discharge the contaminants coming off the membrane element from the system.

These and other objects, features, aspects and advantages of the present invention will become apparent from the following detailed description of the present invention when taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a partially cutaway perspective view showing a spiral wound type membrane element according to an embodiment of the present invention.

FIG. **2** is a transverse cross section showing an example of the envelope-like membranes of the spiral wound type membrane element shown in FIG. **1**.

FIG. **3** is a transverse cross section showing another example of the envelope-like membranes of the spiral wound type membrane element of FIG. **1**.

FIG. **4** is a cross section showing an example of a method of running the spiral wound type membrane element of FIG. **1**.

FIG. **5** is a cross section showing contaminants caught at the peripheral part of the spiral wound type membrane element of FIG. **1**.

FIG. **6** is a partially cutaway perspective view showing back wash reverse filtration operation with the spiral wound type membrane element of FIG. **1**.

FIG. **7** is a front view showing spiral wound type membrane elements according to another embodiment of the present invention.

FIG. **8** is a partially cutaway perspective view showing a conventional spiral wound type membrane element.

FIG. **9** is an external perspective view of the conventional spiral wound type membrane element.

FIG. **10** is a cross section showing an example of a method of running the conventional spiral wound type membrane element.

FIG. **11** is a partially cutaway perspective view showing back wash reverse filtration operation with the conventional spiral wound type membrane element.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

FIG. **1** is a partially cutaway perspective view showing a spiral wound type membrane element according to an

embodiment of the present invention. FIG. **2** is a transverse cross section showing an example of the envelope-like membranes of the spiral wound type membrane element shown in FIG. **1** and FIG. **3** is a transverse cross section showing another example of the envelope-like membranes of the spiral wound type membrane element shown in FIG. **1**.

The spiral wound type membrane element **1** shown in FIG. **1** includes a spiral membrane component **1***a* formed by winding a plurality of independent envelope-like membranes **3** or a plurality of continuous envelope-like membranes **3** around the external surface of a water collection pipe **2** formed of a perforated hollow pipe. Raw water spacers (raw water passage forming members) **4** are inserted between the envelope-like membranes **3** for the purpose of preventing the envelope-like membranes **3** from coming into contact with each other to reduce the membrane area and also for the purpose of forming a passage for raw water. The periphery of the spiral membrane component **1***a* is covered with a peripheral passage forming member **5** formed of a net of plastic, such as polypropylene, polyethylene, polystyrene, metal, rubber, fiber, etc.

As shown in FIG. **2** and FIG. **3**, each envelope-like membrane **3** is formed by putting two separation membranes **7** on both sides of a permeate spacer (a permeate passage forming member) **6** and bonding them together on three sides, whose opening part is attached to the peripheral surface of the water collection pipe **2**. Low-pressure reverse osmosis membranes which are run at 10 kgf/cm^2 or lower, ultrafiltration membranes, or microfiltration membranes are used as the separation membranes **7**.

In the example shown in FIG. **2**, the plurality of envelope-like membranes **3** include independent separation membranes **7**. In the example shown in FIG. **3**, the plurality of envelope-like membranes **3** are formed by folding a continuous separation membrane **7**.

If the thickness of the raw water spacers **4** is larger than 0.5 mm, it is difficult to catch contaminants in raw water at least at the periphery of the membrane element **1**. If the raw water spacers **4** have a thickness smaller than 0.1 mm, the envelope-like membranes **3** are then likely to come into contact with each other, which reduces the membrane area. Accordingly, it is preferred that the raw water spacers **4** have a thickness of 0.1 mm or larger and 0.5 mm or smaller.

If the thickness of the peripheral passage forming member **5** is larger than 30 mm, the volumetric efficiency of the membrane element **1** with respect to the pressure vessel accommodating the membrane element **1** becomes small. If the thickness of the peripheral passage forming member **5** is smaller than 0.6 mm, the flow velocity of the raw water for discharging contaminants attached on at least the periphery of the membrane element **1** out of the system becomes small in back wash reverse filtration with permeate. Hence it is preferred that the peripheral passage forming member **5** has a thickness of 0.6 mm or larger and 30 mm or smaller.

FIG. **4** is a cross section showing an example of a method of running the spiral wound type membrane element of this preferred embodiment. As shown in FIG. **4**, the pressure vessel (pressure-resisting vessel) **10** is formed of a tubular case **11** and a pair of end plates **12***a* and **12***b*. An inlet **13** for raw water is formed in one end plate **12***a* and an outlet **15** for raw water is formed in the other end plate **12***b*. An outlet **14** for permeate is formed in the center of the other end plate **12***b*.

The spiral wound type membrane element **1** is accommodated in the tubular case **11** and both opening ends of the tubular case **11** are sealed with the end plates **12***a* and **12***b*. One end of the water collection pipe **2** is engaged with the permeate outlet **14** of the end plate **12***b* and an end cap **16** is attached to the other end. Piping **17** and a valve **18** are connected to the raw water outlet **15** of the end plate **12***b*.

When the spiral wound type membrane element **1** is run, raw water **51** is introduced into the pressure vessel **10** from the raw water inlet **13** of the pressure vessel **10**. The raw water **51** enters the spaces between the envelope-like membranes **3** along the raw water spacers **4** from at least the periphery of the spiral wound type membrane element **1**. In the example shown in FIG. **4**, the raw water **51** enters the spaces between the envelope-like membranes **3** from the periphery and both ends of the spiral wound type membrane element **1**. Permeate passed through the separation membranes **7** flows into the water collection pipe **2** along the permeate spacers **6**. Then the permeate **52** is taken out from the permeate outlet **14** of the pressure vessel **10**. Thus dead end filtration is performed.

In this case, since the raw water spacers **4** are so thin that contaminants such as suspended substances are at least caught on the periphery (in the example in FIG. **4**, on the periphery and at both ends) of the membrane element **1**, a cake layer of the contaminants at least forms on the periphery of the membrane element **1**. Cake filtration is effected by the cake layer on at least the periphery of the membrane element **1**, and membrane filtration is effected by the separation membranes **7** inside the membrane element **1**.

The raw water may be partially extracted from the raw water outlet **15** by opening the valve **18**. In this case, a flow of raw water can be formed in the periphery of the membrane element **1**. Then it is possible to discharge part of contaminants in the raw water out of the pressure vessel **10** while suppressing sedimentation of the contaminants.

After filtration is performed in a certain time period, back wash reverse filtration is performed with permeate from the permeate side. FIG. **6** is a partially cutaway perspective view showing back wash reverse filtration operation with the spiral wound type membrane element **1** in FIG. **1**. In back wash reverse filtration, permeate **52** is introduced into the water collection pipe **2** from the permeate outlet **14** of FIG. **4**. The permeate guided out from the peripheral surface of the water collection pipe **2** permeates through the envelope-like membranes **3** in the opposite direction to that in the filtration operation and flows along the raw water spacers **4** to the periphery at least. This, as shown in FIG. **5**, causes at least the contaminants **100** caught on the periphery (in the example shown in FIG. **4**, on the periphery and both ends) of the membrane element **1** to easily come off.

This process is followed by flushing wash with raw water. That is to say, the valve **18** is opened while supplying raw water **51** from the raw water inlet **13** of FIG. **4**, so that the raw water flows in the axial direction along the periphery of the membrane element **1**. This causes the contaminants remaining on the periphery of the membrane element **1** to come off from the membrane element **1**, and the contaminants stripped off from the membrane element **1** are discharged out of the system through the raw water outlet **15** and the piping **17** in FIG. **4**. As the result, the flux of permeate is largely recovered as compared with before the back wash reverse filtration.

According to the above-described washing method, contaminants caught by the membrane element **1** can be removed easily and certainly, which always maintains stable permeate flow rate.

Furthermore, in the spiral wound type membrane element **1** of this embodiment, filtration carried out in the above-

described manner does not form a dead space S in the gap between the membrane element **1** and the pressure vessel **10**. This prevents problems caused by propagation of various germs such as microorganisms, generation of a bad smell due to decomposition of organic matter, and decomposition of the separation membranes, thus providing high reliability.

Further, since pressures are applied to the membrane element **1** from all directions, the membrane element **1** is not deformed, which eliminates the necessity of using packing holders and a sheath. This reduces the parts cost and production cost.

Further, it is not necessary to use a large pump to supply raw water since dead end filtration is performed. This reduces the system cost.

FIG. **7** is a front view showing spiral wound type membrane elements according to another embodiment of the present invention. In FIG. **7**, the peripheral passage forming member is not shown.

With the spiral wound type membrane element **1** of FIG. **7**(*a*), both ends of the spiral membrane component **1***a* are sealed with resin layers **19**. With the spiral wound type membrane element **1** shown in FIG. **7**(*b*), the spiral membrane component **1***a* is sealed with a resin layer **19** on its one end.

The spiral wound type membrane elements **1** shown in FIGS. **7**(*a*) and (*b*) require an increased number of process steps in fabrication, but they do not require a space for supply of raw water at both ends or at one end of the membrane elements **1**. This allows size reduction of the pressure vessel, thus allowing size reduction of a spiral wound type membrane module formed by accommodating the membrane element **1** in a pressure vessel.

Further, when the end of the membrane element **1** sealed with the resin layer **19** is positioned on the side of the raw water inlet in the pressure vessel, it is possible to prevent dirt from attaching to the end of the membrane element **1** due to dynamic pressure of raw water when raw water is introduced.

While the invention has been described in detail, the foregoing description is in all aspects illustrative and not restrictive. It is understood that numerous other modifications and variations can be devised without departing from the scope of the invention.

What is claimed is:

1. A raw liquid filter system for dead-end filtration, comprising:

a housing,

a generally cylindrical spiral membrane component generally having an outer perimeter defined by two ends of the spiral membrane component and a membrane peripheral surface extending between the two ends, the spiral membrane being disposed in the housing to allow raw liquid to flow through a space provided between the outermost peripheral surface of the membrane and the housing,

wherein said spiral membrane component comprises

a perforated hollow pipe having at least one opening end for guiding permeate and having a peripheral surface,

a plurality of envelope-like membranes each having an end disposed proximate to said peripheral surface of said perforated hollow pipe and each extending generally radially outwardly from said perforated hollow pipe, the ends of adjacent membranes forming a plurality of envelope openings open to said perforated hollow pipe, the envelope openings substantially surrounding the entire peripheral surface of the perforated hollow pipe, and

raw liquid passage forming members interposed between said plurality of membranes, said raw liquid passage forming members being positioned to supply raw liquid, which enters the spiral membrane component through the membrane peripheral surface of the outer perimeter in a generally axial direction, which is generally perpendicular to the peripheral surface of the perforated hollow pipe, to the perforated hollow pipe.

2. The spiral wound type membrane element according to claim **1**, wherein raw liquid is supplied from the peripheral side and both end sides of said spiral membrane component.

3. The spiral wound type membrane element according to claim **1**, wherein one end of said spiral membrane component is sealed and raw liquid is supplied from the peripheral side and the other end side of said spiral membrane component.

4. The spiral wound type membrane element according to claim **1**, wherein both ends of said spiral membrane component are sealed and raw liquid is supplied from the peripheral side of said spiral membrane component.

5. The spiral wound type membrane element according to claim 1, further comprising a peripheral passage forming member covering the periphery of said spiral membrane component, said peripheral passage forming member being adapted to supply raw liquid therethrough from the peripheral side of said spiral membrane component into said spiral membrane component.

6. The spiral wound type membrane element according to claim **5**, wherein said peripheral passage forming member has a thickness of not less than 0.6 mm nor more than 30 mm.

7. The spiral wound type membrane element according to claim **5**, wherein said peripheral passage forming member is a net formed of plastic, metal, rubber, or fiber.

8. The spiral wound type membrane element according to claim **1**, wherein said raw liquid passage forming member has a thickness of not less than 0.1 mm nor more than 0.5 mm.

9. The spiral wound type membrane element according to claim 1, wherein each of said plurality of envelope-like membranes comprises two separation membranes and a permeate passage forming member interposed between said two separation membranes, wherein said two separation membranes are bonded together on three sides and the opening of said envelope-like membrane is attached to the peripheral surface of said perforated hollow pipe.

10. The spiral wound type membrane element according to claim **1**, wherein each of said plurality of envelope-like membranes is formed of a low-pressure reverse osmosis membrane, an ultrafiltration membrane or a microfiltration membrane.

11. The spiral wound type membrane element according to claim **1**, further comprising a pressure vessel in which said spiral membrane component is accommodated.

12. A method (A) for running a raw liquid filter system performing dead-end filtration, the system comprises: a housing, a generally cylindrical spiral membrane component generally having an outer perimeter defined by two ends of the spiral membrane component and a membrane peripheral surface extending between the two ends, the spiral membrane being disposed in the housing to allow raw liquid to flow through a space provided between the outermost peripheral surface of the membrane and the housing, wherein the spiral membrane component comprises: a perforated hollow pipe having at least one opening end for

guiding permeate and having a peripheral surface, a plurality of envelope-like membranes each having an end disposed proximate to said peripheral surface of said perforated hollow pipe and each extending generally radially outwardly therefrom, the ends of adjacent membranes forming a plurality of envelope openings open to said perforated hollow pipe, the envelope openings substantially surrounding the entire peripheral surface of the perforated hollow pipe, and raw liquid passage forming members interposed between said plurality of envelope-like membranes, the raw liquid passage forming members being positioned to supply raw liquid, which enters the spiral membrane component through the membrane peripheral surface of the outer perimeter in a generally axial direction, which is generally perpendicular to the peripheral surface of the perforated hollow pipe, to the perforated hollow pipe, the method comprising the steps of,

supplying raw liquid from at least the peripheral side of said spiral wound type membrane element to said membranes via said raw liquid passage forming members,

guiding permeate generally radially inwardly through said membranes, and

taking out permeate from at least one opening end of said perforated hollow pipe.

13. The spiral wound type membrane element running method (A) according to claim **12**, wherein said step of supplying raw liquid comprises supplying raw liquid from the peripheral side and both end sides of said spiral wound type membrane element.

14. The spiral wound type membrane element running method (A) according to claim **12**, wherein one end of said spiral wound type membrane element is sealed, and

said step of supplying raw liquid comprises supplying raw liquid from the peripheral side and the other end side of said spiral wound type membrane element.

15. The spiral wound type membrane element running method (A) according to claim **12**, wherein said spiral wound type membrane element is sealed at both ends, and

said step of supplying raw liquid comprises supplying raw liquid from the peripheral side of said spiral wound type membrane element.

16. A method for washing a raw liquid filter system for performing dead-end filtration, the system comprises: a housing, a generally cylindrical spiral membrane component generally having an outer perimeter defined by two ends of the spiral membrane component and a membrane peripheral surface extending between the two ends, the spiral membrane being disposed in the housing to allow raw liquid to flow through a space provided between the outermost peripheral surface of the membrane and the housing, wherein the spiral membrane component comprises: a perforated hollow pipe having at least one opening end for guiding permeate and having a peripheral surface, a plurality of envelope-like membranes each having an end disposed proximate to said peripheral surface of said perforated hollow pipe and each extending generally radially outwardly from said perforated hollow pipe, the ends of adjacent membranes forming a plurality of envelope openings open to said perforated hollow pipe, the envelope openings substantially surrounding the entire peripheral surface of the perforated hollow pipe, and raw liquid passage forming members interposed between said plurality of envelope-like membranes, the raw liquid passage forming members being positioned to supply raw liquid, which enters the spiral membrane component through the membrane peripheral surface of the outer perimeter in a generally axial direction, which is generally perpendicular to the peripheral surface of the perforated hollow pipe, to the perforated hollow pipe, the method comprising the steps of,

introducing a washing liquid from at least one opening end of said perforated hollow pipe, and

discharging the washing liquid guided out from the peripheral surface of said perforated hollow pipe from at least the periphery of said spiral wound type membrane element.

17. The spiral wound type membrane element washing method according to claim **16**, further comprising the step of causing washing liquid to flow in the axial direction along the periphery of said spiral wound type membrane element.

18. The spiral wound type membrane element washing method according to claim **16**, wherein said washing liquid is permeate.

19. The spiral wound type membrane element washing method according to claim **16**, wherein said step of discharging the washing liquid comprises discharging the washing liquid guided out from the peripheral surface of said perforated hollow pipe from the periphery and both ends of said spiral wound type membrane element.

20. The spiral wound type membrane element washing method according to claim **16**, wherein said spiral wound type membrane element is sealed at its one end, and

said step of discharging the washing liquid comprises discharging the washing liquid guided out from the peripheral surface of said perforated hollow pipe from the periphery and the other end of said spiral wound type membrane element.

21. The spiral wound type membrane element washing method according to claim **16**, wherein said spiral wound type membrane element is sealed at both ends, and

said step of discharging the washing liquid comprises discharging the washing liquid guided out from the peripheral surface of said perforated hollow pipe from the periphery of said spiral wound type membrane element.

22. A method for running a raw liquid filter system for performing dead-end filtration, the system comprises: a housing, a generally cylindrical spiral membrane component generally having an outer perimeter defined by two ends of the spiral membrane component and a membrane peripheral surface extending between the two ends, the spiral membrane being disposed in the housing to allow raw liquid to flow through a space provided between the outermost peripheral surface of the membrane and the housing, wherein the spiral membrane component comprises: a perforated hollow pipe having at least one opening end for guiding permeate and having a peripheral surface, a plurality of envelope-like membranes each having an end disposed proximate to said peripheral surface of said perforated hollow pipe and each extending generally radially outwardly from said perforated hollow pipe, the ends of adjacent membranes forming a plurality of envelope openings open to said perforated hollow pipe, the envelope openings substantially surrounding the entire peripheral surface of the perforated hollow pipe, and raw liquid passage forming members interposed between said plurality of envelope-like membranes, the raw liquid passage forming members being positioned to supply raw liquid, which enters the spiral membrane component through the membrane peripheral surface of the outer perimeter in a generally axial direction, which is generaslly perpendicular to the peripheral surface of the perforated hollow pipe, to the perforated hollow pipe, the method comprising the steps of,

when running, supplying raw liquid from at least the peripheral side of said spiral wound type membrane element, and taking out permeate from at least one opening end of said perforated hollow pipe, and

when washing, introducing permeate from at least one opening end of said perforated hollow pipe, and discharging the permeate guide out from the peripheral surface of said perforated hollow pipe from at least the periphery of said spiral wound type membrane element.

23. The spiral wound type membrane element running method (B) according to claim **22**, further comprising the step of, when washing, causing washing liquid to flow in the axial direction along the periphery of said spiral wound type membrane element.

24. The spiral wound type membrane element running method (B) according to claim **22**,

wherein said step of supplying raw liquid comprises supplying raw liquid from the peripheral side and both end sides of said spiral wound type membrane element, and

said step of discharging permeate comprises discharging the permeate guided out from the peripheral surface of said perforated hollow pipe from the periphery and both ends of said spiral wound type membrane element.

25. The spiral wound type membrane element running method (B) according to claim **22**, wherein said spiral wound type membrane element is sealed at its one end, and

said step of supplying raw liquid comprises supplying raw liquid from the peripheral side and the other end side of said spiral wound type membrane element, and

said step of discharging permeate comprises discharging the permeate guided out from the peripheral surface of said perforated hollow pipe from the periphery and the other end of said spiral wound type membrane element.

26. The spiral wound type membrane element running method (B) according to claim **22**, wherein said spiral wound type membrane element is sealed at both ends, and

said step of supplying raw liquid comprises supplying raw liquid from the peripheral side of said spiral wound type membrane element, and

said step of discharging permeate comprises discharging the permeate guided out from the peripheral surface of said perforated hollow pipe from the periphery of said spiral wound type membrane element.

27. A method for running a raw liquid filter system for dead-end filtration comprising: a housing, a generally cylindrical spiral membrane component generally having an outer perimeter defined by two ends of the spiral membrane component and a membrane peripheral surface extending between the two ends, the spiral membrane being disposed in the housing to allow raw liquid to flow through a space provided between the outermost peripheral surface of the membrane and the housing, wherein said spiral wound type membrane element comprises a perforated hollow pipe having at least one opening end for guiding permeate and having a peripheral surface, a plurality of envelope-like membranes each having an end disposed proximate to said peripheral surface of said perforated hollow pipe and each extending generally radially outwardly therefrom, the ends of adjacent membranes forming a plurality of envelope openings open to said perforated hollow pipe, the envelope openings substantially surrounding the entire peripheral surface of the perforated hollow pipe, and a plurality of raw liquid passage forming members interposed between said plurality of envelope-like membranes, said raw liquid passage forming members being positioned to supply raw liquid, which enters the spiral membrane component through the membrane peripheral surface of the outer perimeter in a generally axial direction, which is generally perpendicular to the peripheral surface of the perforated hollow pipe, to the perforated hollow pipe, the method comprising the steps of:

supplying raw liquid through said inlet of said vessel from at least the peripheral side of said spiral wound type membrane element to said membranes via said raw liquid passage forming members;

guiding permeate generally radially inwardly through said membranes; and

taking out permeate from at least one opening end of said perforated hollow pipe.

28. A method for washing a spiral wound type membrane module, wherein said spiral wound type membrane module comprising: a housing, a generally cylindrical spiral membrane component generally having an outer perimeter defined by two ends of the spiral membrane component and a membrane peripheral surface extending between the two ends, the spiral membrane being disposed in the housing to allow raw liquid to flow through a space provided between the outermost peripheral surface of the membrane and the housing, wherein said spiral wound type membrane element comprises a perforated hollow pipe having at least one opening end for guiding permeate and having a peripheral surface, a plurality of envelope-like membranes each having an end disposed proximate to a peripheral surface of said perforated hollow pipe and each extending generally radially outwardly therefrom, the ends of adjacent membranes forming a plurality of envelope openings open to said perforated hollow pipe, the envelope openings substantially surrounding the entire peripheral surface of the perforated hollow pipe, and a plurality of raw liquid passage forming members interposed between said plurality of envelope-like membranes, said raw liquid passage forming members being positioned to supply raw liquid, which enters the spiral membrane component through the membrane peripheral surface of the outer perimeter in a generally axial direction, which is generally perpendicular to the peripheral surface of the perforated hollow pipe, to the perforated hollow pipe, the method comprising the steps of:

introducing a washing liquid from at least one opening end of said perforated hollow pipe;

discharging the washing liquid guided out from the peripheral surface of said perforated hollow pipe from at least the periphery of said spiral wound type membrane element; and

taking out the washing liquid from said continuous space through said outlet of said vessel.

29. The method for washing the spiral wound type membrane module according to claim **28**, further comprising the step of causing raw liquid to flow in the axial direction along the periphery of said spiral wound type membrane element from said inlet of said vessel to said outlet of said vessel through said continuous space.

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